

SUMMARY OF PHASE I

AND

PHASE II PROGRAMS

PHOENIX GOODYEAR AIRPORT

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**ICF TECHNOLOGY
INCORPORATED**



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PHOENIX-GOODYEAR AIRPORT

PHASE II PILOT HOLE BORING PROGRAM

1.1 INTRODUCTION

The Phoenix-Goodyear Airport (PGA) Superfund site is located approximately 20 miles west of Phoenix, Arizona, in Township One North, Range One West, of the Gila and Salt River Baseline and Meridian (See Figure 1 for Study Area Location Map and Figure 2 for Site Location of PGA). The site, which encompasses an area of approximately 25 square miles, is within the jurisdictions of the cities of Goodyear, Avondale, and Phoenix. Investigations at the PGA site, which began in the early 1980s revealed that the soil and groundwater at the site were contaminated with volatile chlorinated solvents, including trichloroethylene (TCE), 1,1-dichloroethylene (DCE) and tetrachloroethylene (PCE), and chromium (Ecology and Environment, 1986; Engineering-Science, 1988; CH2M Hill, 1988). In September 1983, EPA added the PGA site to the National Priorities List. Subsequently, a remedial investigation (RI) was initiated under the federal Superfund program (Ecology and Environment, 1986). The RI characterized the site, identified potential sources of chemicals in the aquifer, and identified possible clean-up solutions for the site.

A feasibility study evaluated various alternatives for the cleanup of Section 16 at the PGA site. This section in the southern portion of the site and includes the Loral Corporation facility (formerly owned by Goodyear Aerospace Corporation) and the Phoenix-Goodyear Airport (formerly owned and operated by the U.S. Navy). The recommended treatment plan consisted of pumping the water from the aquifer, removing the volatile organics from the water by air stripping, and reinjecting the treated water into the aquifer. On September 29, 1987, the U.S. Environmental Protection Agency issued a Record of Decision specifying a separate operable unit remedy for the clean-up of Section 16 at the site (EPA, 1987).

In August 1988, Goodyear conducted a pilot plant test of the air stripping and groundwater recharge system in Section 16. Based on the results of the pilot test and groundwater modeling, a full-scale treatment system was designed for the restoration of groundwater. The final design was presented in the Final Draft Design and Specifications, PGA Operable Unit Treatment Plant (ICF, 1989). The proposed treatment system will withdraw water from the aquifer with 10 extraction wells, remove volatile organics by air stripping, and recharge the treated water into the aquifer with 11 injection wells. The treatment will be implemented in two phases over a period of two years. During Phase I, five extraction and five injection wells will be installed. During Phase II, the remaining five extraction wells and six injection wells will be installed. The system will treat groundwater at 1,200 gallons per minute (gpm) and will be operated for approximately 20 years.

1.2 SUMMARY OF PHASE I PROGRAM

ICF Technology Inc.(ICF) conducted well drilling and aquifer testing at the Phoenix-Goodyear Airport from March through July 1989. This work was performed in accordance with the consent

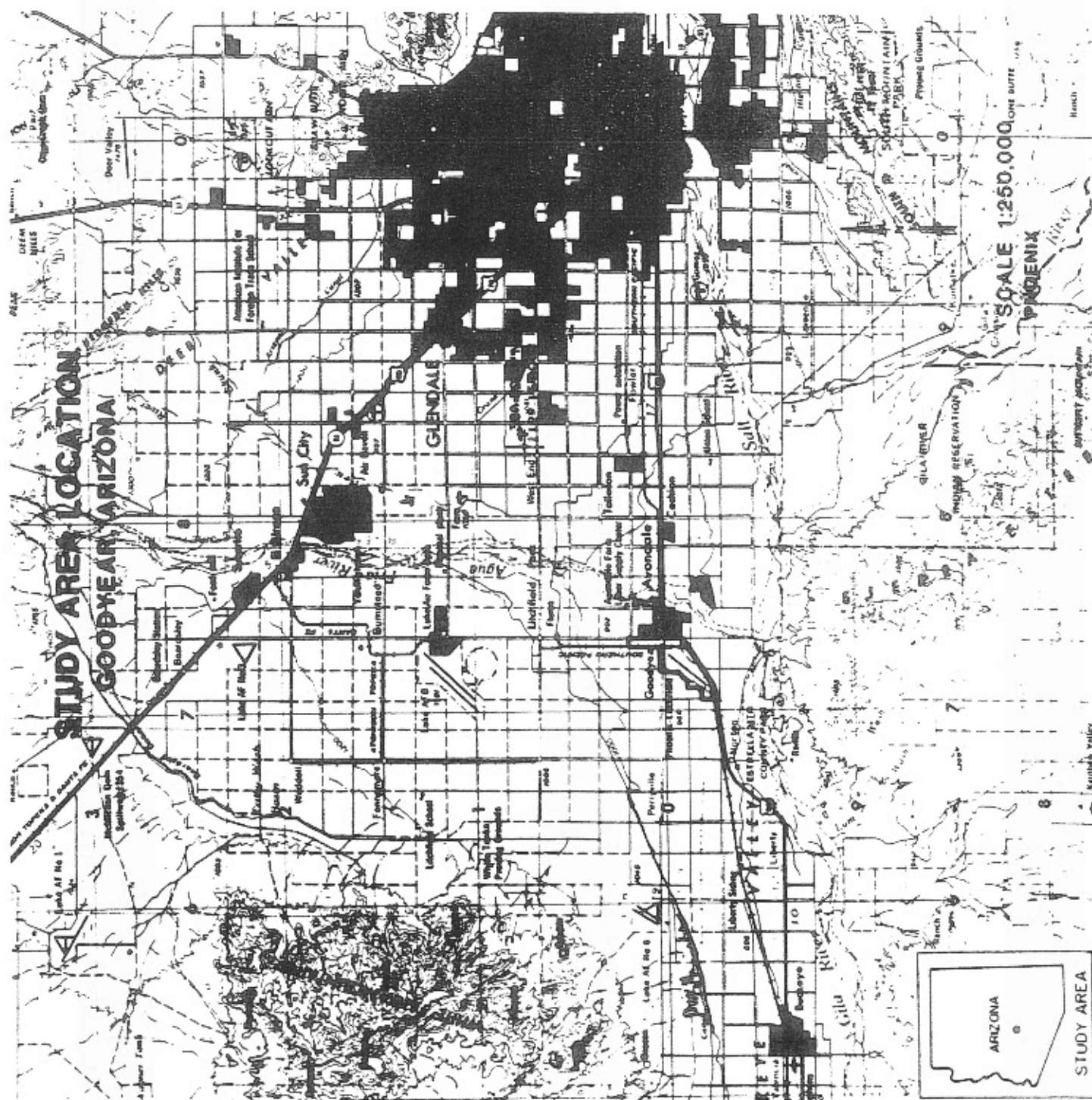


Figure 1

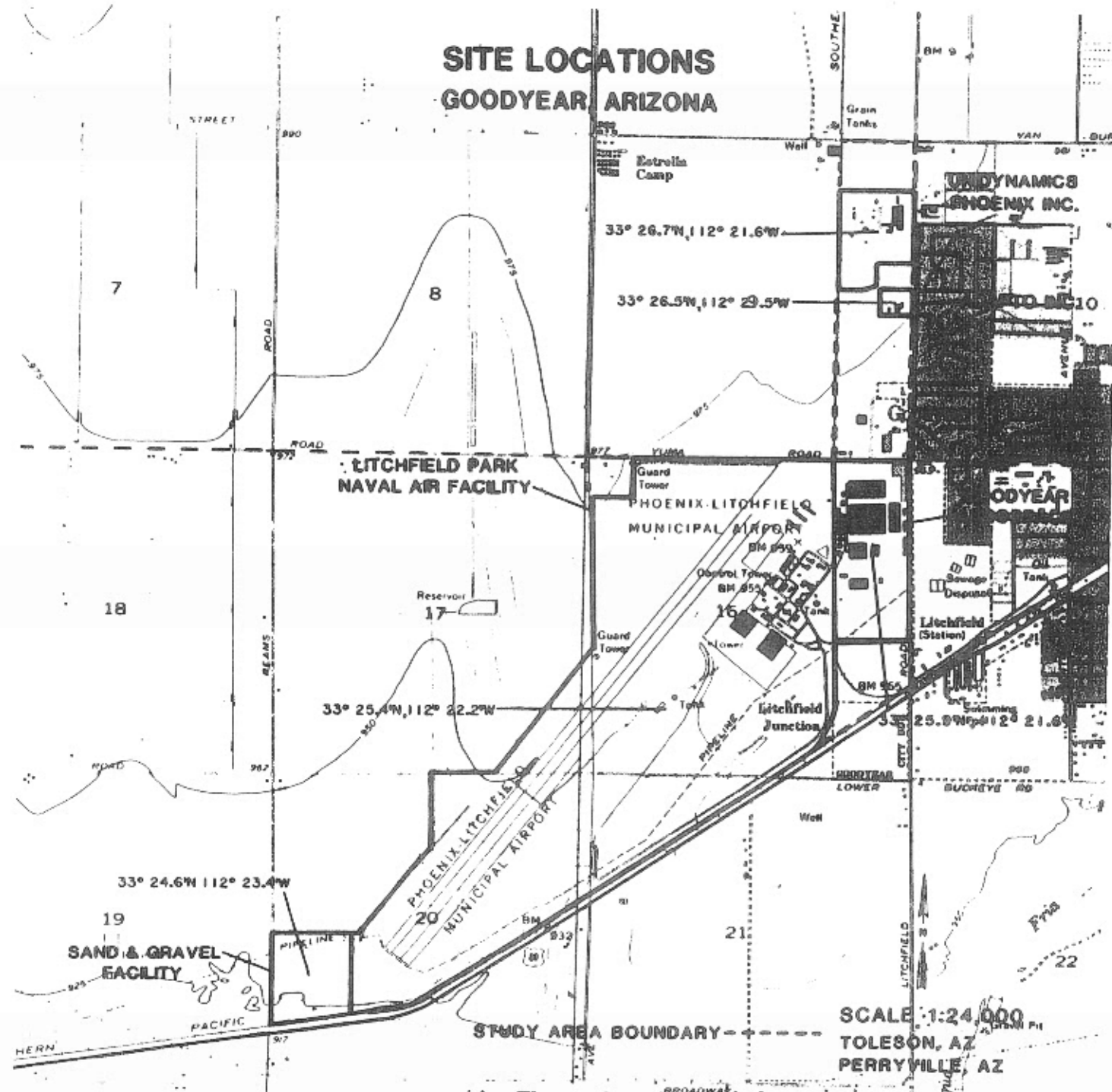


Figure 2

order signed by the Goodyear Tire and Rubber Company and the EPA under Task 104 of ICF's contract with Goodyear.

Drilling, well installation, well development, and aquifer testing were performed by Beylik Drilling Inc. of La Habra, California under the supervision of ICF geologists. Chemical laboratory analysis were performed by Analytical Technologies Inc. of Tempe, Arizona, and sieve analyses were performed by Sergeant, Hauskins, and Beckwith of Phoenix, Arizona.

ICF began drilling and well installation in March 1989. A total of four monitoring wells (NEW-1 through NEW-4), seven extraction wells (E-1 through E-7), and 10 injection wells (I-1 through I-10) were included in the program plan (Figure 3 shows the locations of the original Phase I and II well locations). During the course of drilling extraction wells, ICF discovered that geological conditions were not favorable at the originally planned locations due to a high percentage of fine soils in the saturated interval of Subunit A. One of the extraction wells (E-3) was completed as planned except that the depth was increased; another (E-4) was converted to a four-inch PVC monitoring well; and one (E-7) was drilled, but then abandoned without installing the casing or screen.

Following consolidation of all collected data, ICF and Goodyear met with the EPA to present the data and to request an extension of Consent Decree deadlines (which was granted). In addition, a revised plan was presented to the EPA that involved drilling five extraction wells (NE-1 through NE-5) at new locations. The locations of the injection wells were not changed, and seven of the original 11 injection wells were planned to be installed (I-1, I-3, I-4, I-6, I-8, I-9, and I-10). Also proposed as part of the revised program were test holes placed within 50 feet of the extraction/injection well locations, into which one-inch PVC piezometer/observation wells would be installed (Figure 4 illustrates the location of the Phase I extraction and injection). Soil samples were collected during the drilling of the test holes for logging purposes (to determine if conditions were favorable for well installation at those locations) and performing sieve/grain size analyses for well design (ICF, 1991).

The revised plan was approved by the EPA and was implemented starting with test hole drilling from May 15 to May 23, 1989, and continuing with extraction/ injection well drilling and aquifer testing from May 31 through July 3, 1989. The treatment plant was constructed and began operating in December 1989 under the direction of another consultant.

Original Proposed Well Locations

Phase I & II

Phoenix Goodyear Airport Site

Legend

● Extraction Wells

■ Injection Wells

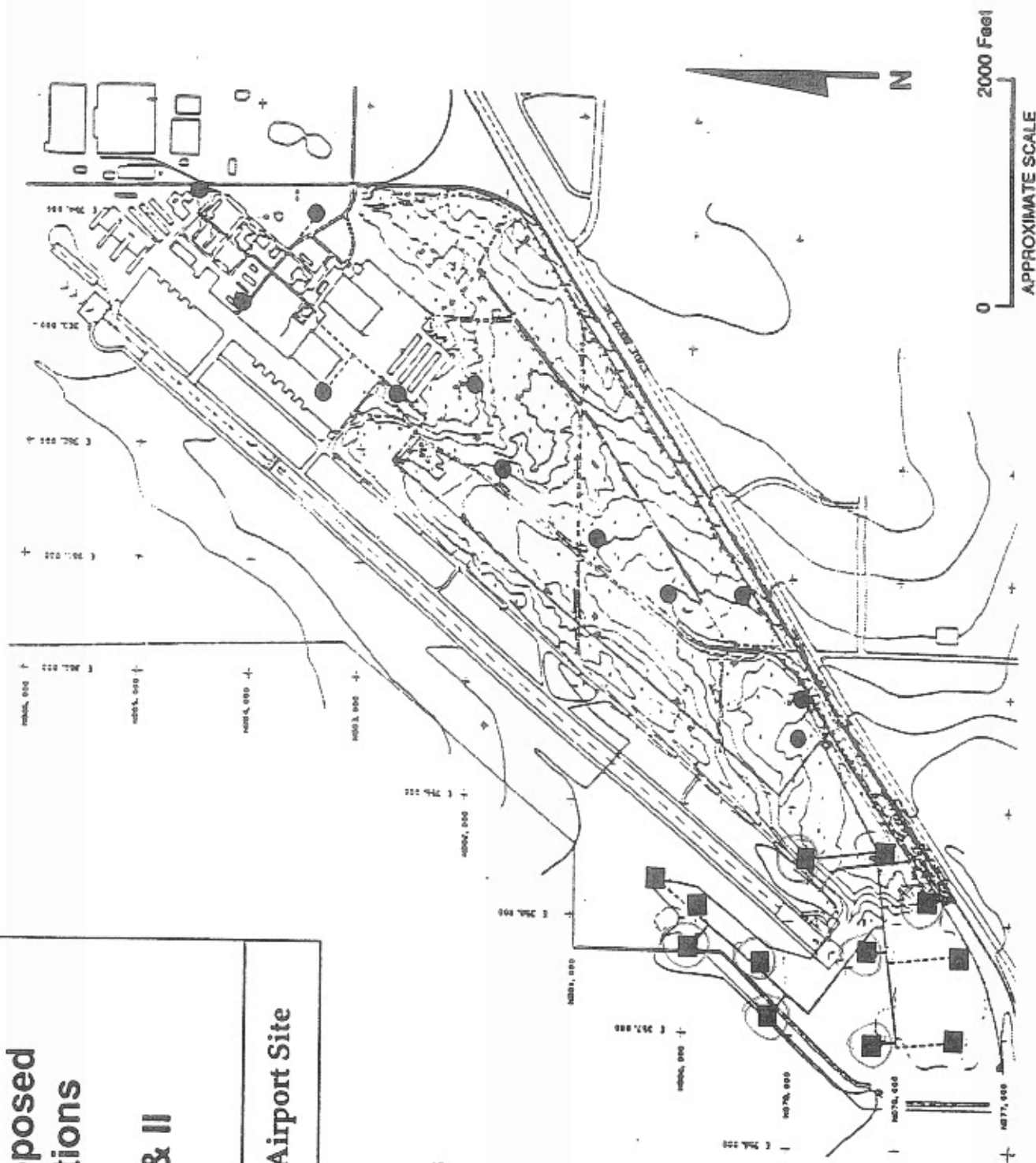


Figure 3

Phase I

Legend

- Extraction Wells
- Injection Wells



2.0 SITE GEOLOGY AND HYDROGEOLOGY; CONCLUSIONS FROM PHASE I AND PRE-EXISTING REPORTS

2.1 GEOLOGY

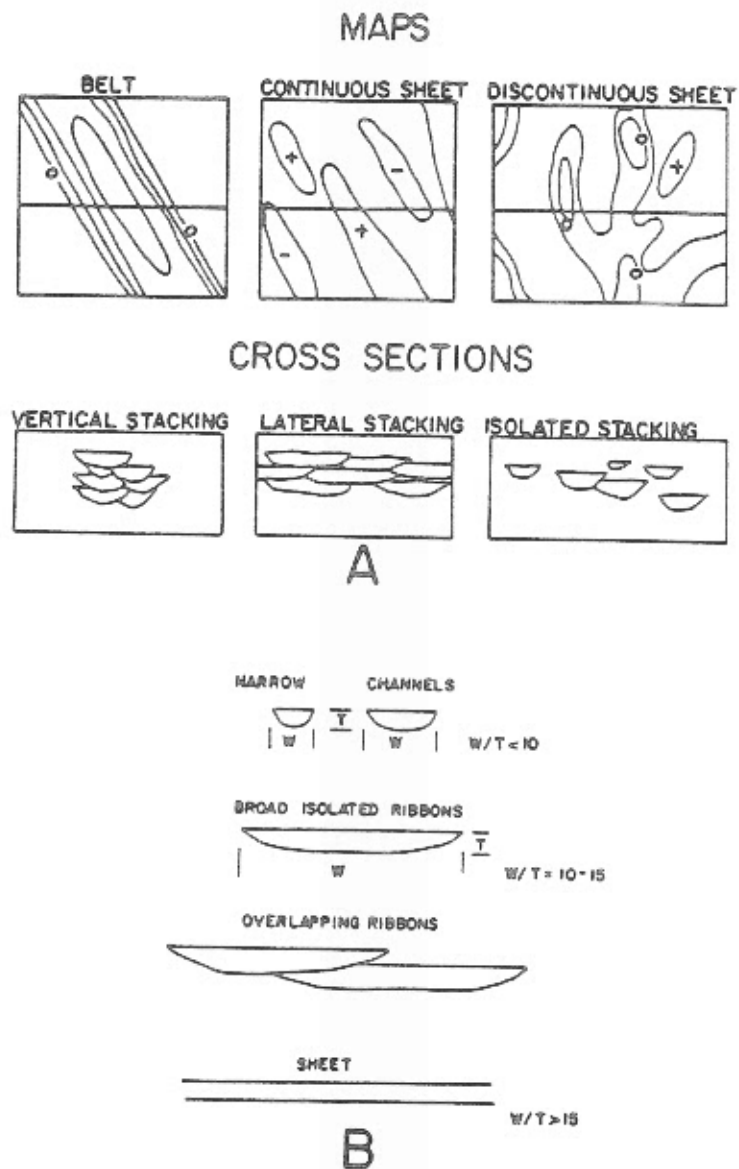
The Phase I program demonstrated the complex nature of the geology and hydrogeology at the PGA site. Geologic conditions (encountering fine grained sediments) resulted in modifications in locating the extraction and injection wells. Previous RI reports indicated that Subunit A of the Upper Alluvial Aquifer contained coarse sediments composed of predominantly gravel and sands deposited by the through-flowing Gila River system. While this description is true, sufficient detail was lacking in explaining the complexities of the fluvial depositional environment. The stratigraphic sequence of the fluvial depositional environment has direct bearing on the potential pathways for groundwater movement and contaminant transport.

Subunit A of the Upper Alluvial Aquifer is composed of sediments ranging from clay particles to gravel and boulder-size sediments. These sediments have been deposited by the current river systems (Agua Fria and the Gila River) during the past several million years. The river systems deposit sediments ranging in size from silts and clays (deposited laterally away from the channels in flood plains and overbank deposits) to sands and gravels (deposited in the stream channel or adjacent to the channels). As these stream channels migrate laterally and horizontally (through deposition), the stratigraphic sequence becomes complex, ultimately comprising numerous buried stream channels that are stacked vertically, offset horizontally, stacked laterally and that can be broad or very narrow in appearance (Figure 5 illustrates the principal types of fluvial reservoir geometries).

The alluvial drainage system in arid regions of the United States result from tectonic activity during which large blocks of the land surface are uplifted, creating mountain ranges. The areas between the mountain ranges are flat-lying basin regions where deposition occurs from sediments shed off the mountainous terrains. The deposition of sediments causes land subsidence in the basin areas, and ultimately thousands of feet of sediments can accumulate. As sediments are shed off mountainous regions, fan-shaped deposits of sediments called alluvial fans are formed. These fan-shaped depositional environments are created when streams flowing from mountains reach the flat lying basin areas, thus reducing the stream velocity and the carrying capacity. The coarser sediments are deposited first, and even further away from the source region, the finer sediments are deposited. Figure 6 illustrates a sedimentary facies and profile of arid-region alluvial fans while Figure 7 illustrates a hypothetical fluvial system from the source region to a delta.

2.2 DEPOSITIONAL HISTORY OF PGA SITE

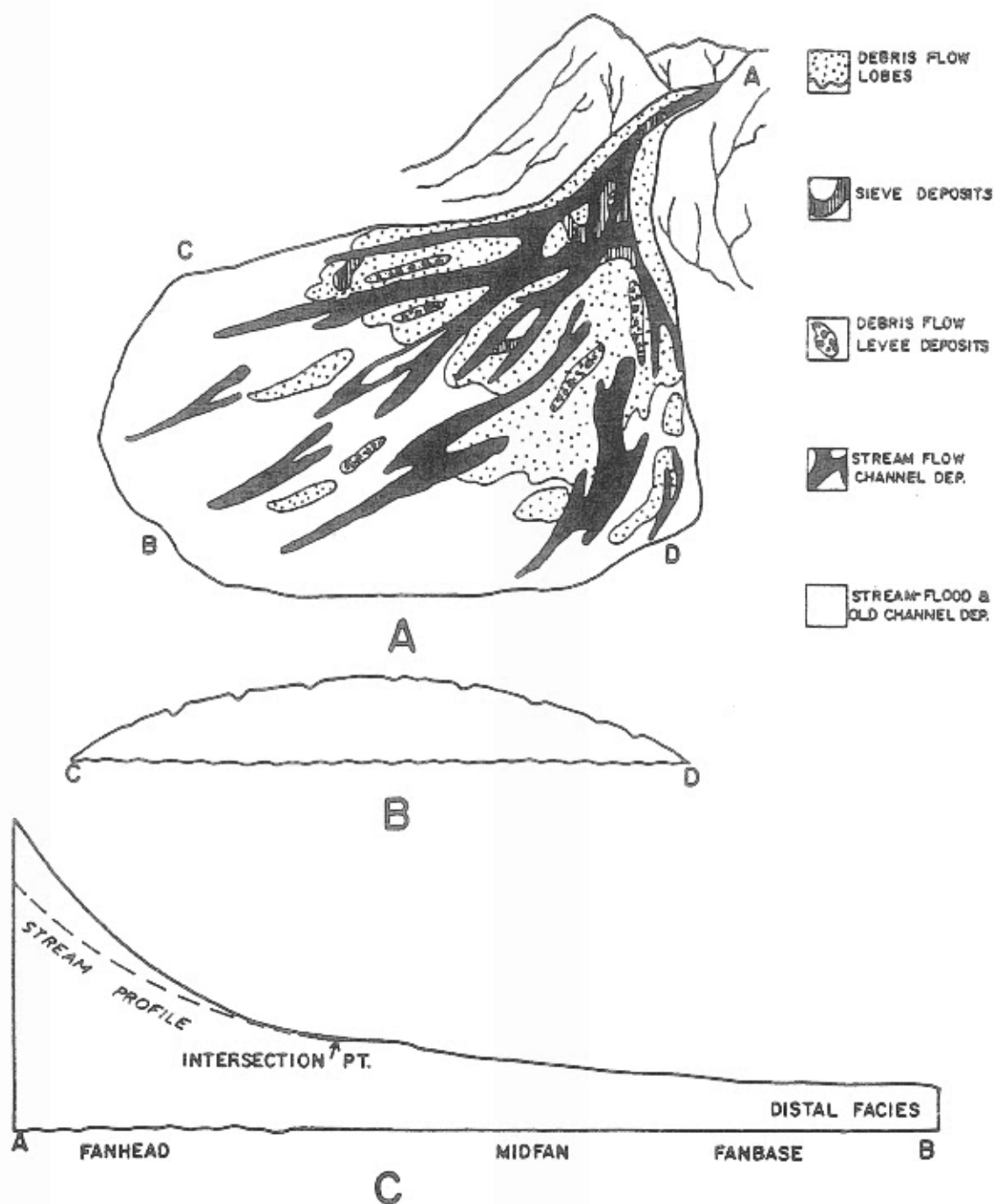
Knowledge of an area's geomorphic history and current depositional patterns, one can characterize and predict sediment loads, channel patterns and other characteristics in the fluvial system. Figure 8 illustrates the principal river types, and Figure 9 classifies channels based on pattern and type of sediment load. The Gila and Agua Fria river systems that currently exist in the Goodyear-Phoenix area are typical of braided and slightly meandering channel patterns. Sediment size in these fluvial systems are large; stream velocities are high; and stream channels have



- (A) Principal types of sandstone reservoir geometries illustrated for fluvial sandstone bodies.
- (B) Cross-sectional geometries of fluvial sandstone and conglomerate bodies.

Source: Ethridge, 1985; Surface and Subsurface Methods of Investigation and Classification of Fluvial Systems.

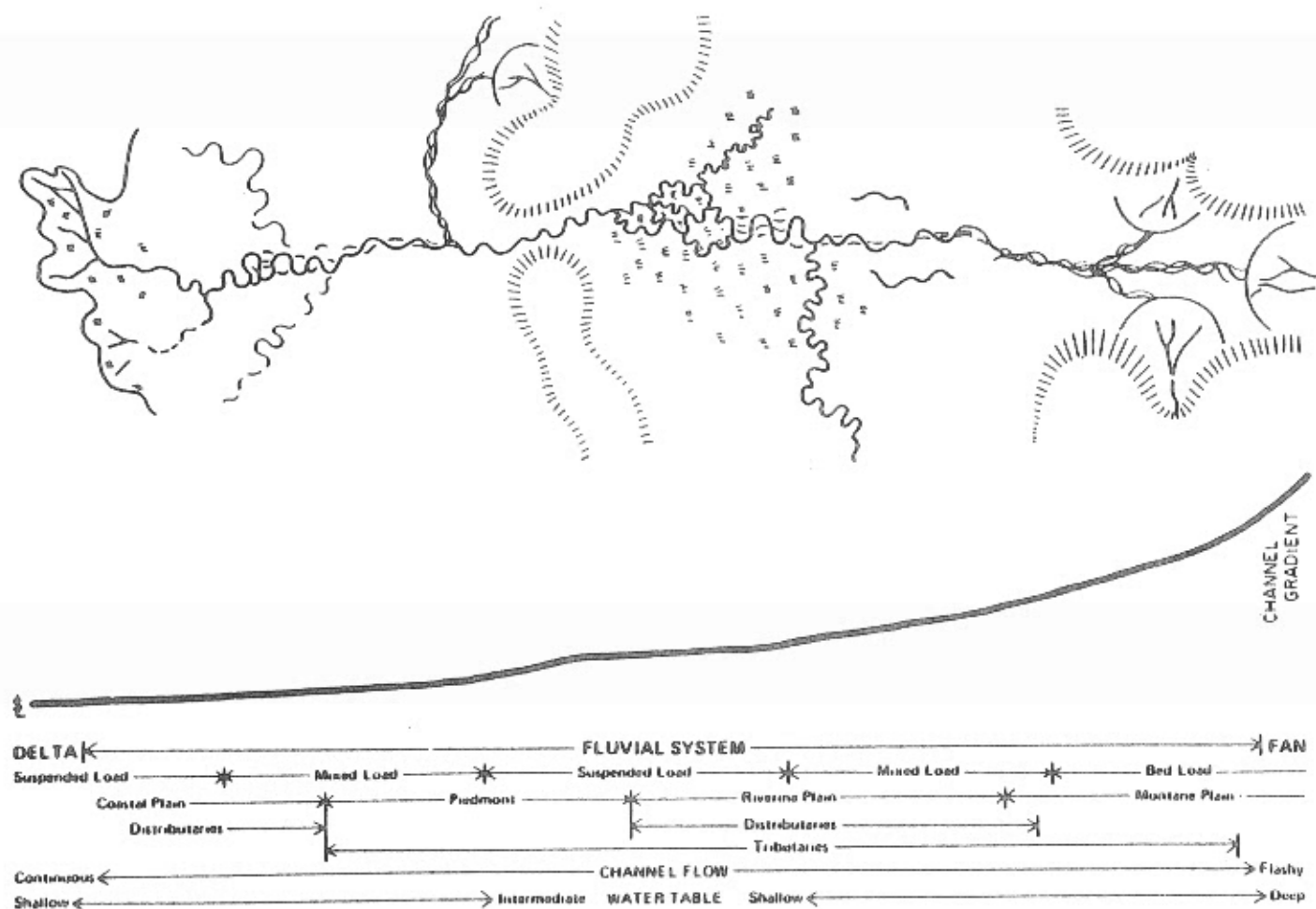
Figure 5



Distribution of Sedimentary deposits and profiles of an idealized arid-region fan.

Source: Ethridge, 1985; Modern Alluvial Fans and Fan Deltas.

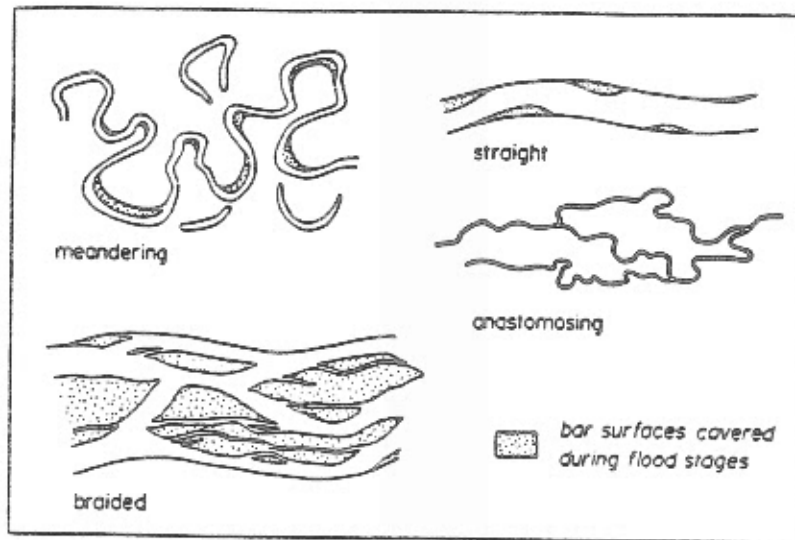
Figure 6



Hypothetical fluvial system traversing a montane basin and associated riverine plain and debouching across a piedmont into a prograding, deltaic coastal plain.

Source: Galloway, 1985; Meandering-Streams Modern and Ancient.

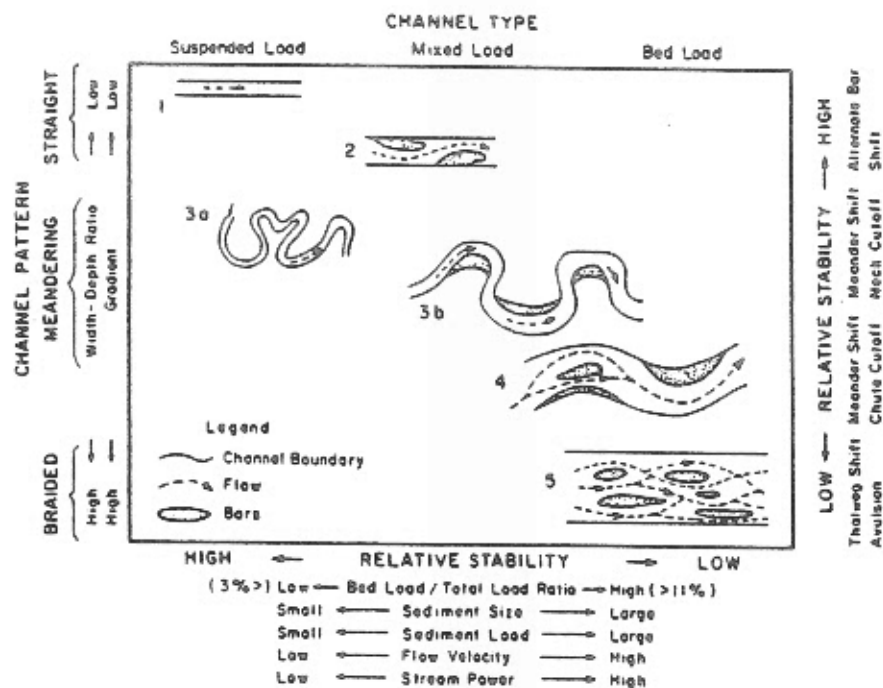
Figure 7



Plan view configuration of principal river types.

Source: Ethridge, 1985; Surface and Subsurface Methods of Investigation and Classification of Fluvial Systems.

Figure 8



Channel Classification based on pattern and type of sediment load with associated variables and relative stability indicated.

Source: Ethridge 1985; Surface and Subsurface Methods of Investigation and Classification of Fluvial Systems

Figure 9

relatively low stability. In other words, these stream channels will migrate laterally through time as stream velocities and sediment loading varies and subsequently burying previously deposited stream sediments.

A review of U.S.G.S. topographic maps and historical aerial photographs of the site indicated the possibility of paleostream channels oriented in a north-to-south direction through the PGA site. The topographic map (Figure 10) illustrates the basin region between the Sierra Estrella Mountain Range to the south and the White Tank Mountain Range to the west. The Agua Fria River flows in a southerly direction to the east the PGA site, and the Gila River flows in a westerly direction to the south of PGA. The Gila and Agua Fria river systems probably migrated laterally throughout this region during recent geologic time (several millions of years).

Geologic cross sections of subsurface sediments were constructed from the existing well log data from the Phase I program and from previous investigations (Appendix A contains several cross sections generated from Subunit A well data). Cross sections from previous investigations were predominantly oriented parallel to the runway. These cross sections also generalized the geology of the site into fine and coarse-size sediments. The cross sections were created to show the complex sedimentary sequence, to illustrate the depositional history, and to determine if buried stream channels were trending in a northerly to southerly direction.

These cross sections in Appendix A illustrate the interpretation of north-south trending, buried stream channels and show similarities in pattern as in Figure 5. These cross-sections illustrate the variable and complex depositional history of the area, which directly influences groundwater and contaminant movement.

2.3 AQUIFER CHARACTERISTICS FROM PHASE I PROGRAM

During the Phase I program, five extraction and seven injection wells were drilled and constructed, then pump tests were performed. One of the injection wells (I-3) is not being used because of poor infiltration rates. A summary of the well construction for the extraction and injection well is shown in Tables 1 and 2, respectively. Aquifer characteristics for the extraction wells are noted in Table 3. The results of these tests depict variable pumping rates and drawdowns within the extraction wells. The pump test data indicate the variable hydrogeologic conditions that exist at this site.

The geologic information and pump test data depict a heterogeneous hydrogeologic system. Variations in sediment size influence permeability and hydraulic conductivities of the aquifer material. Zones of higher hydraulic conductivity (coarser grained sediments) will show preferential flow over zones of lower hydraulic conductivity (fine grained sediments).

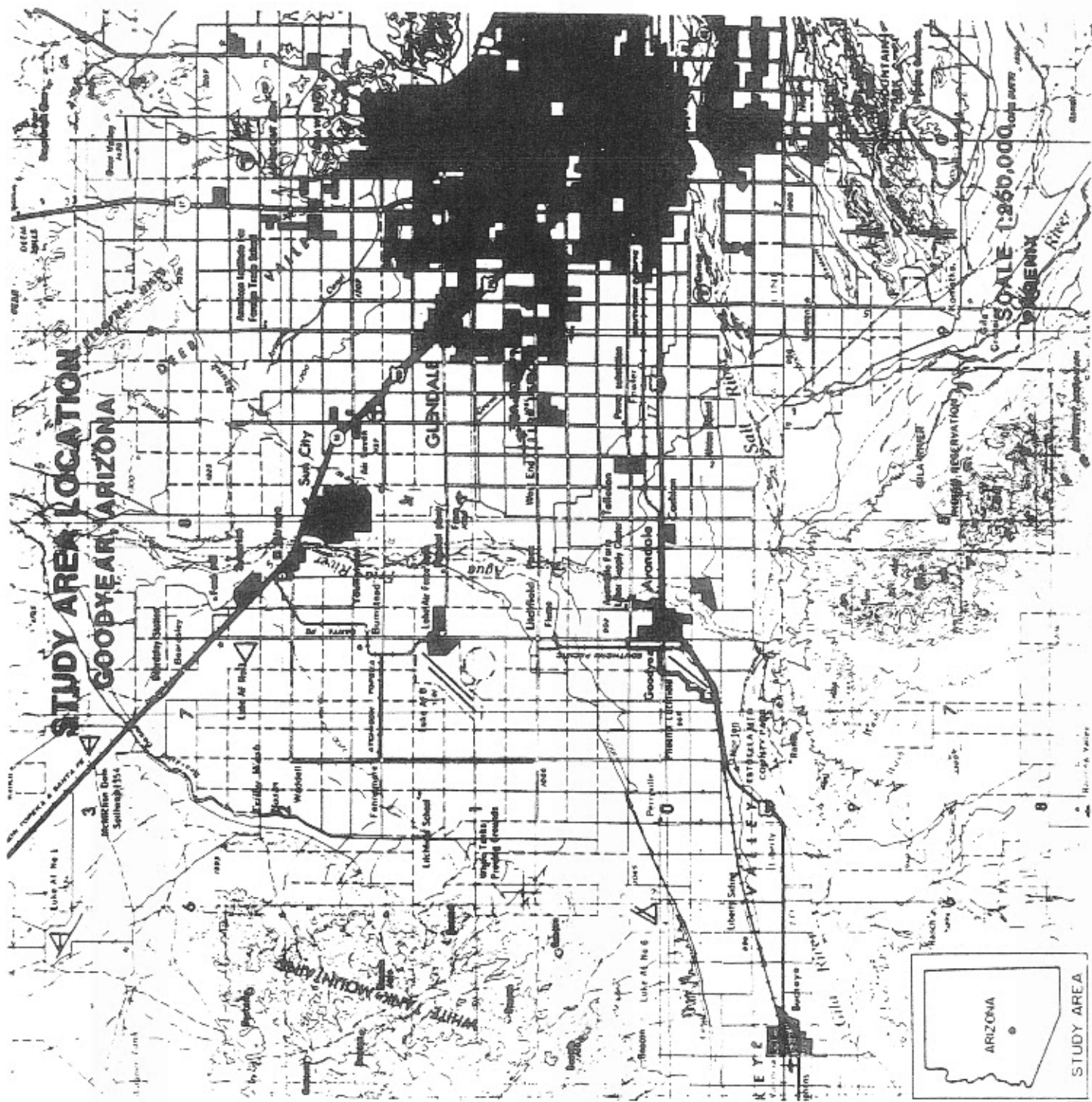


Figure 10

TABLE 1

PHASE I - WELL CONSTRUCTION SUMMARY
PGA WELL DATA
EXTRACTION WELL SUMMARY

	Ext. Wells as Bid	NE-1	NE-2	NE-3	NE-4	NE-5
Drilled Depth	110'	96'	92'	92'	96.5'	98'
Cased Depth	110'	90'	90'	90'	95'	95'
0.040" Screen Interval	85' - 105'	55' - 85'	60' - 65'	55' - 85'	50' - 55'	50' - 60'
0.020" Screen Interval			65' - 85'		70' - 90'	80' - 90'
Total Screen Length	30'	30'	25'	30'	25'	20'
Stainless Casing Intervals	40' - 85' 105' - 110'	35' - 55' 85' - 90'	35' - 60' 85' - 90'	35' - 55' 85' - 90'	30' - 50' 55' - 70' 40' - 75'	30' - 50' 60' - 80' 90' - 95'
Total Stainless Casing Length	40'	25'	30'	25'	40'	45'
Conductor Casing Interval	0' - 40'	0' - 35'	0' - 35'	0' - 35'	0' - 30'	0' - 30'
Pump Test Pumping Rate	100	110	58	85	36	80
Approximate Drawdown		4'	21'	35'	32'	31'
1989 Depth to Groundwater		46.80'	47.25'	44.70'	46.15'	45.60'

TABLE 2

**PHASE I - WELL CONSTRUCTION SUMMARY
PGA WELL DATA
INJECTION WELL SUMMARY**

	Injection Wells as bid	I-1	I-4	I-6	I-8	I-9	I-10
Drilled Depth	110'	82'	95'	63'	70'	71'	71
Cased Depth	110'	57'	90'	63'	67'	68'	65'
0.040" Screen Interval	30' - 105'	27' - 52'	30' - 65'	28' - 58'	22' - 62'	23' - 63'	35' - 60'
0.020" Screen Interval			75'-85'				25' - 35'
Total Screen Length	75'	25'	45'	30'	40'	40'	35'
Stainless Casing Intervals	20' - 30' 105' - 110'	7' - 27' 52' - 57'	20' - 30' 65' - 75' 85' - 90'	18' - 28' 58' - 63'	12' - 22' 62' - 67'	13' - 23' 63' - 68'	15' - 25' 60' - 65'
Total Stainless Casing Length	15'	25'	25'	15'	15'	15'	15'
Conductor Casing Interval	0' - 20'	0' - 7'	0' - 20'	0' - 18'	0' - 12'	0' - 13'	0' - 15'
Pump Test Pumping Rate	100	17	51	3	<3	39	10
Approximate Drawdown		5'	25'	2'	7'	8'	7'
1989 Depth to Groundwater		39.97'	46.80'	49.55'	79.13'	45.81'	45.52'

TABLE 3
AQUIFER PROPERTIES
PGA EXTRACTION WELLS

	NE-1	NE-2	NE-3	NE-4	NE-5
Pump Test Pumping Rate, gpm	110	58	85	36	80
Approximate Drawdown, ft	4	21	35	32	31
Aquifer Thickness (b), ft	44	44	45	45	50
Transmissivity Values (T), gpd/ft	8580	11440	3870	10350	15000
Est. Hydraulic Conductivity (K), ft/day	195	260	86	230	300

Equations:

$$T = Kb$$

$$K = T/b$$

2.4 GROUNDWATER

Groundwater elevations were collected monthly at the PGA site for Subunit A monitoring, extraction, and injection wells. This information is presented in Figure 11, which is a computer-generated groundwater contour map of the Subunit A aquifer. Produced using March 1991 data, the map illustrates the effect the extraction system has on the groundwater system. The hydraulic gradient across the site ranges from 0.002 to 0.005 and slopes in a westerly-southwesterly direction.

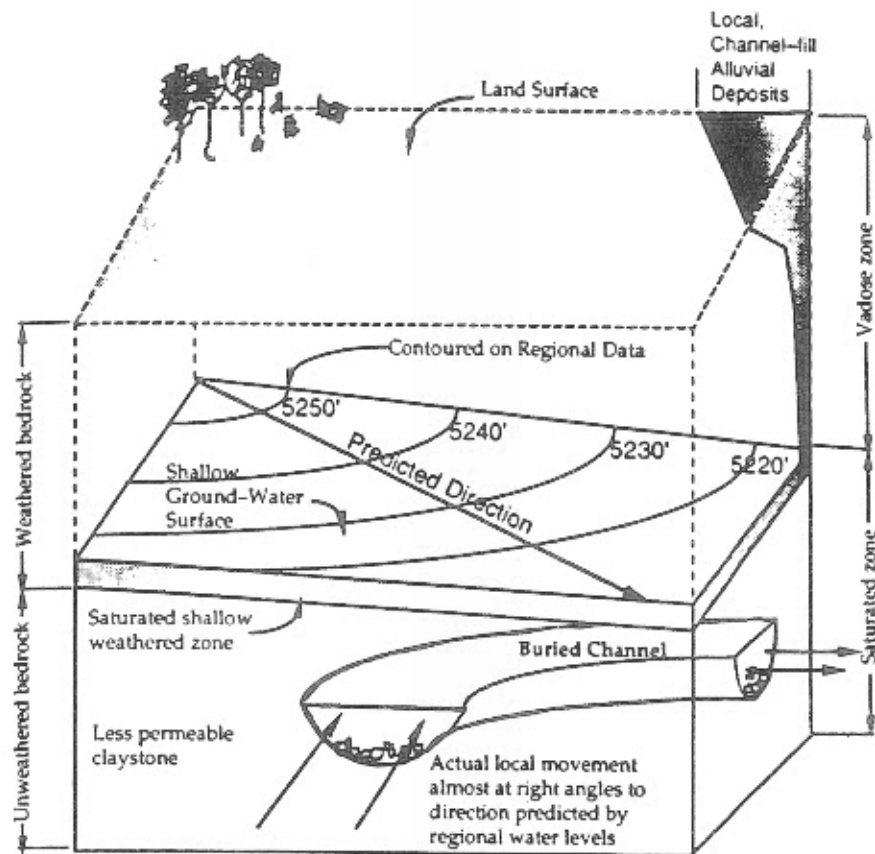
2.5 GROUNDWATER CONTAMINATION

Groundwater samples are collected quarterly for chemical analysis to determine the concentration, extent, and nature of the TCE plume. An isopleth map was produced to illustrate the TCE plume (see Figure 12), which flows in a southerly-southwesterly direction. When overlaid with the groundwater contour map (Figure 13), the plume is offset from the dominant flow direction (except in the area of the extraction wells), indicating that the TCE plume is transported in a different pathway other than in the hydraulic downgradient direction. The groundwater and TCE are preferentially flowing along pathways of higher hydraulic conductivity; these pathways are interpreted as buried stream channels.

An example of this interpretation is provided in Figure 14, which illustrates a geologic environment of low hydraulic conductivity units with a higher hydraulic conductivity unit (i.e. buried stream channel) of significant lateral extent. These stratigraphic sequences can consist of depth-uncorrelatable and vertically-stacked channel deposits that provide preferential pathways for groundwater movement. Each stream channel can have different depositional processes and may not be vertically interconnected. These stream channels may be horizontally connected over short distances and separated vertically by finer-grained sediments (silts and clays). Each buried channel sand has its own primary component of flow in the stratigraphically down-dip direction. Monitoring such a heterogeneous system requires detailed boring log information to determine the location of these channels (Nielson, 1991).

2.6 GROUNDWATER MODELING

A portion of the groundwater treatment program addresses pumping water out of the Subunit A aquifer, then treating and reinjecting the treated water back into the aquifer. These activities must not have any adverse effect upon the groundwater system in the area. ICF developed for the PGA site a groundwater model using the Coupled Fluid, Energy, and Solute Transport (CFEST) software. This model was presented in the Conceptual Design Analysis Report for the Operable Unit Treatment Plant (ICF, 1988). The unit design included 10 extraction wells and 12 recharge wells. The withdrawal rate from the extraction system will be 1,150 gpm. The maximum drawdown during Phase I is predicted to be 8 feet near extraction well NE-1. The maximum mounding is 6 feet and occurs in the center of the recharge zone.



Low hydraulic conductivity environment with a buried, higher hydraulic conductivity channel.

Source: Nielson, 1991. Practical Handbook of Ground-Water Monitoring

Figure 14

Figures 15, 16, 17, and 18 indicate the effects the extraction system will have on the TCE plume after 10 years under winter flow conditions, 10 years under summer flow conditions, 20 years under winter flow conditions, and 20 years under summer flow conditions, respectively. These figures illustrate that the TCE levels after 10 years will still exceed 10 ppb to the south of the PGA property line. After 20 years, the TCE levels will range from 0.5 to 5.0 ppb. The model predicts the TCE can be contained within the limits of PGA after a 20-year period. The current groundwater contour map (Figure 11) shows a groundwater mounding of approximately 4 feet in the central portion of the injection site. Groundwater drawdown is estimated at approximately 2 to 3 feet and is located at extraction well NE-3. The modeling predictions fall short of the current field data, this is to be expected, because of the heterogeneities of the hydrogeologic system. However, the model does illustrate with some degree of confidence the extent of the plume in the southern portion of the PGA property and potentially off-site as well. The model was performed in 1988, prior to completion of the Phase I and Phase II program. Additional information is available that could enhance the results of the groundwater model and should be incorporated.

3.0 PHASE II PROGRAM

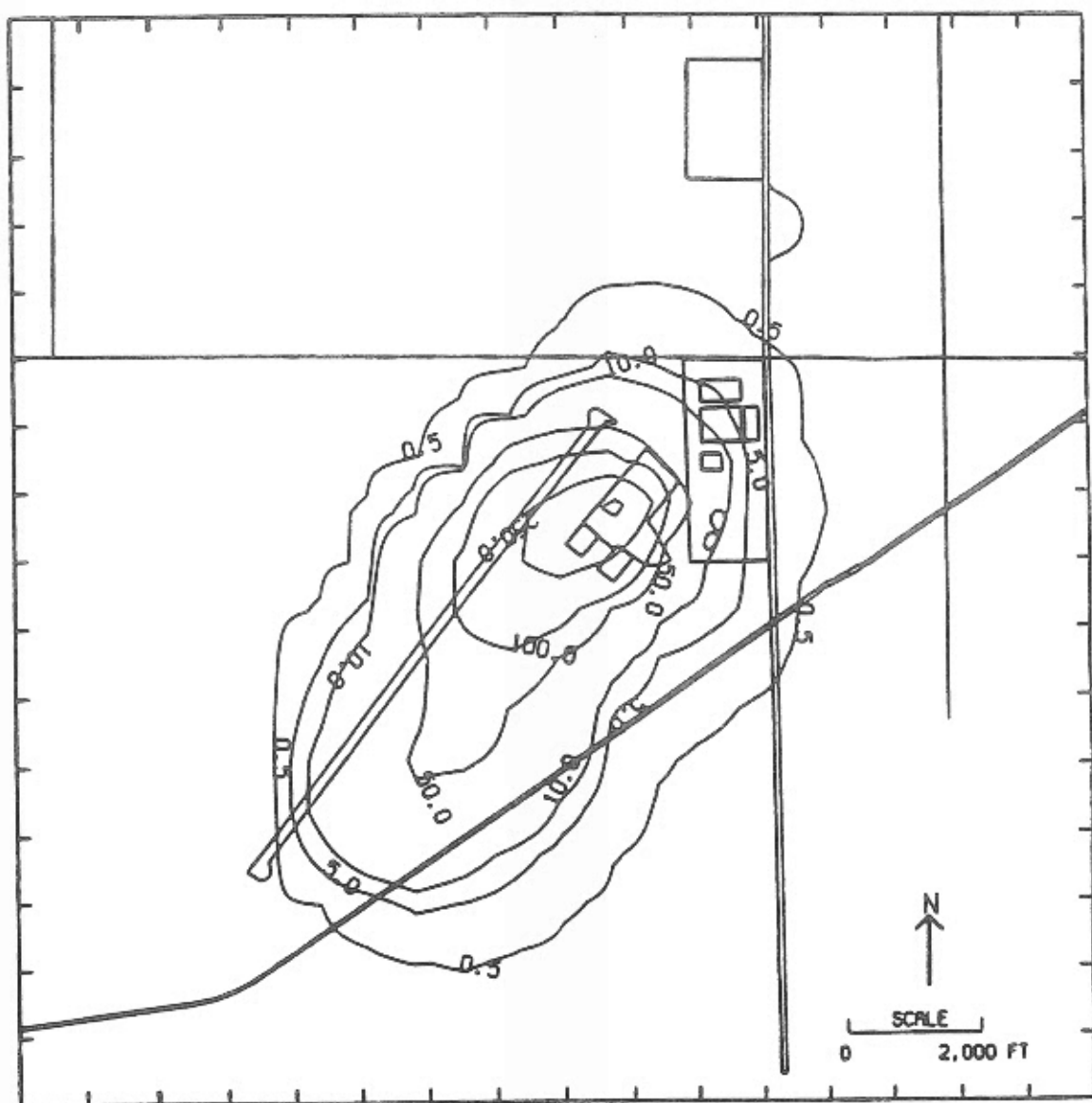
3.1 INTRODUCTION

The original Phase II program called for installing the remaining extraction/injection wells (refer to Figure 3 for original extraction/injection well locations) according to the original plan. Because of the heterogeneous nature of the geology and data high TCE levels in the area of monitoring well EMW-13, however, ICF proposed an alternative plan for Phase II extraction and injection wells in March 1991. This latter plan would aid in properly locating future wells at the PGA site.

In reevaluating Phase I work and reviewing past documentation, water levels and TCE concentrations from the Subunit A monitoring wells, ICF determined that further information was necessary to determine geologic conditions in areas where data was limited or unavailable. In areas where TCE concentrations were 100 parts per billion (ppb) near the southern boundary along Highway 85, ICF was concerned with the off-site migration potential of the TCE plume.

The TCE and groundwater maps indicate that the hydraulic gradient is toward the extraction system, but the TCE plume is oriented in a southerly-southwesterly direction and is offset to the south of the regional hydraulic gradient. Based on previous geologic and hydrologic information, ICF is concerned about potential off-site migration through preferential pathways that are oriented differently than the regional hydraulic gradient indicates. Previous groundwater modeling indicates plume containment can be achieved, but this may be approximately 10-20 years from the present.

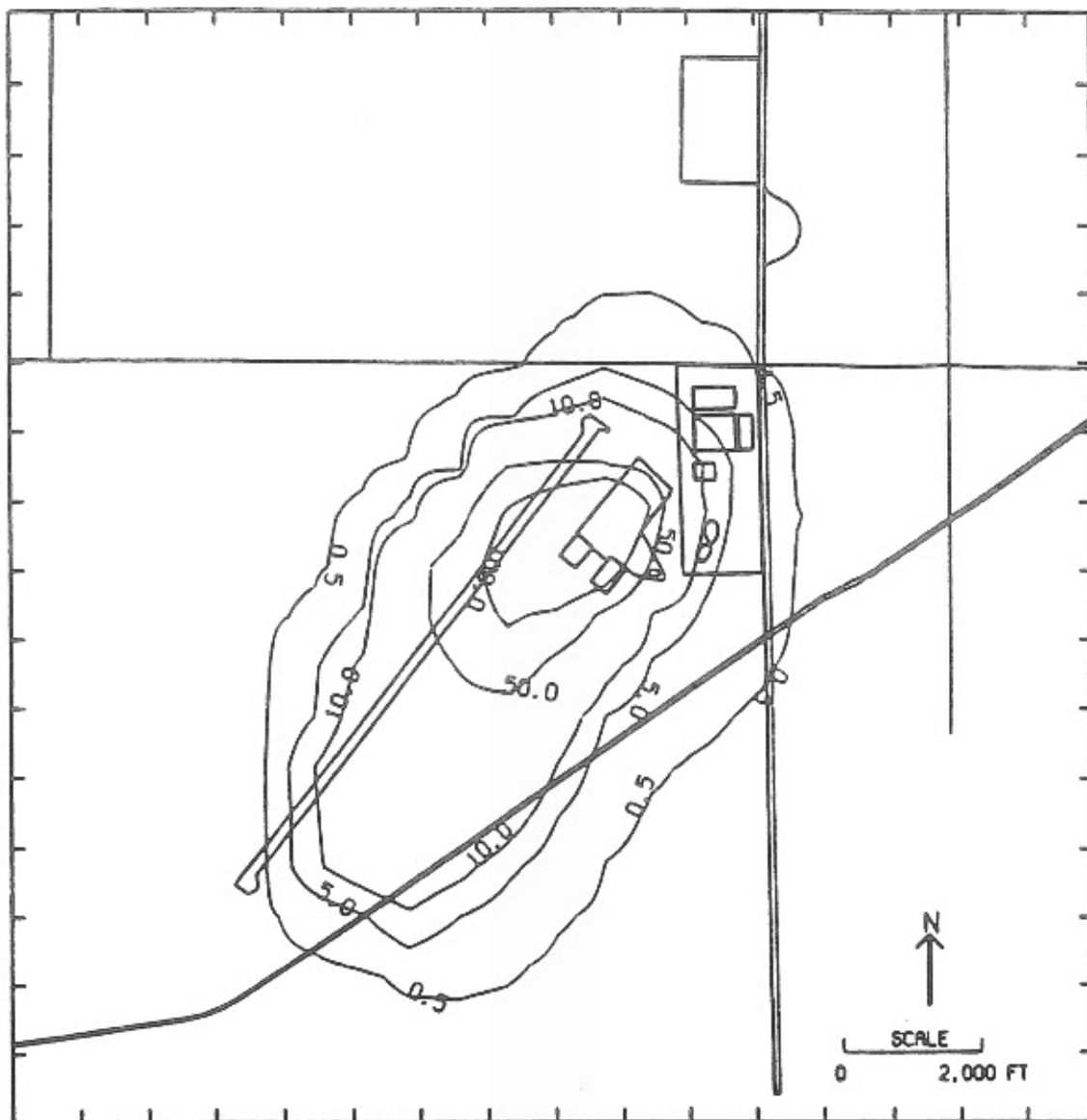
ICF developed a plan to address this situation and presented this to Goodyear and EPA. The proposed plan was to use Cone Penetrometer Tests (CPT) to determine lithology and collect groundwater and soil samples for chemical and grain size analysis. This information would help locate future Phase II wells. CPT would enable ICF to determine the lithology for proposed extraction/injection wells quicker than with traditional borings and split spoon sampling. CPT utilizes a specially design probe to continuously measure dynamic pore pressure, cone resistance and sleeve friction which can be calibrated with well log information to determine subsurface lithologic characteristics.



Predicted TCE Levels (ppb) at Water Table after 10 years of Pumping under Winter Flow Conditions, Uniform Design (1,600 gpm).

Source: ICF 1988; Design Analysis of Operable Unit Remedy for the PGA Site.

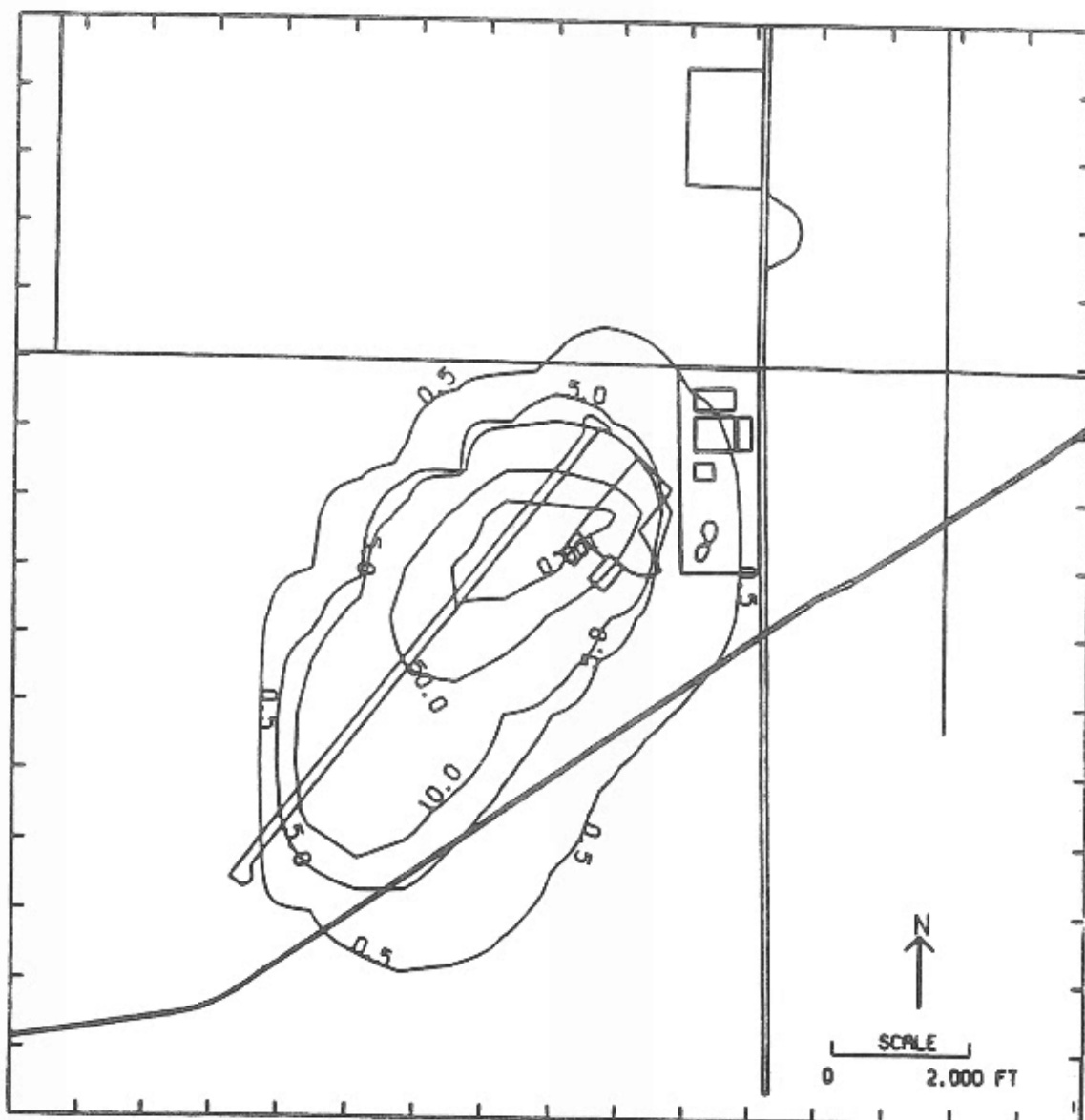
Figure 15



Predicted TCE Levels (ppb) at Water Table after 10 years of pumping under Summer Flow Conditions, Uniform Design (1,600 gpm).

Source: ICF, 1988; Design Analysis of Operable Unit Remedy for the PGA Site.

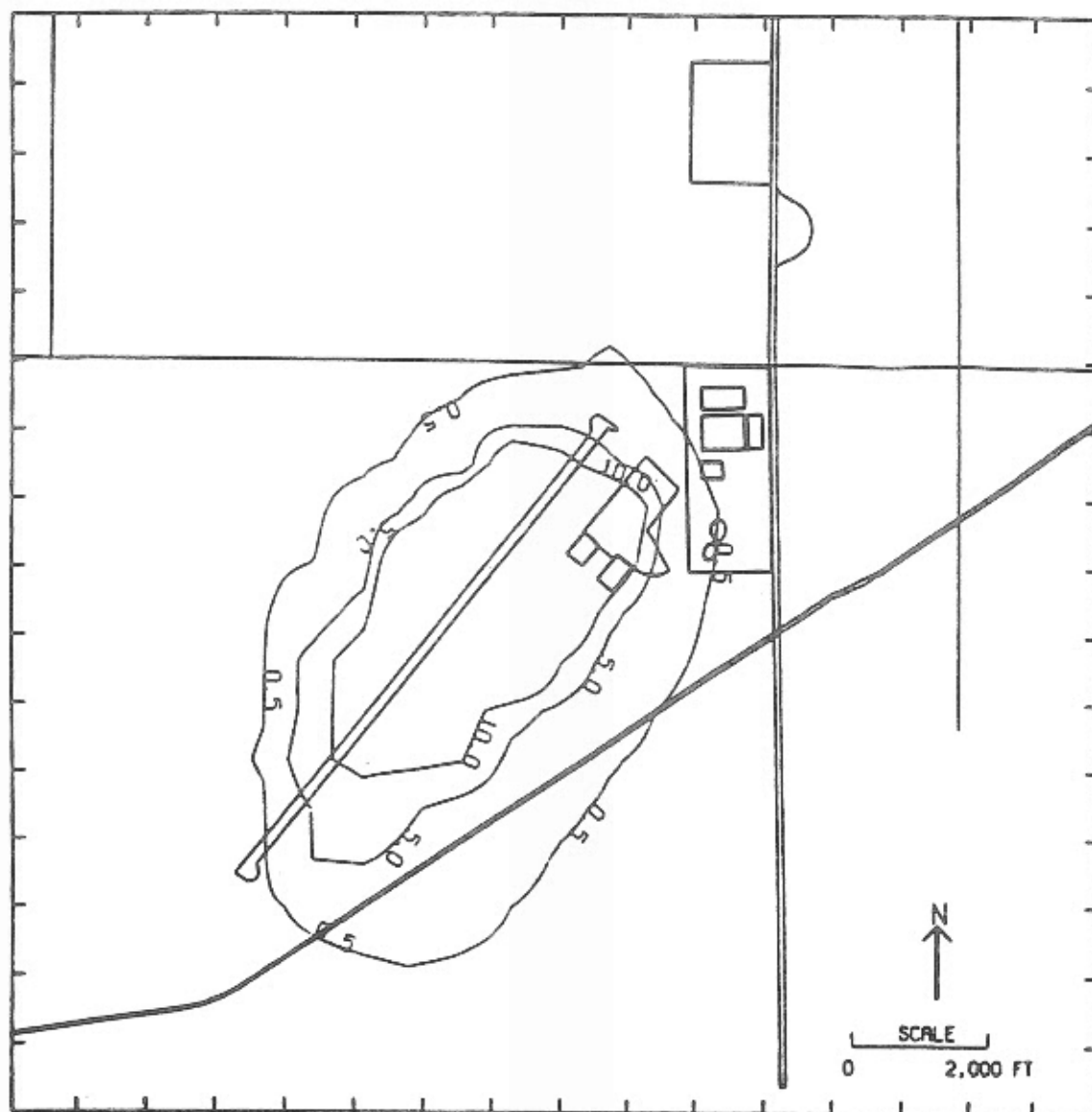
Figure 16



Predicted TCE Levels (ppb) at Water Table after 20 years of pumping under /winter Flow Conditions, Uniform Design (1,600 gpm).

Source: ICF, 1988. Design Analysis of Operable Unit Remedy for the PGA Site.

Figure 17



Predicated TCE Levels (ppb) at Water Table after 20 years of Pumping under Summer Flow Conditions, Uniform Design (1,600 gpm).

Source: ICF, 1988. Design Analysis of Operable Unit Remedy for the PGA Site.

Figure 18

A total of 29 CPT sites (Figure 19) were located for determining the location of Phase II extraction/injection wells. In addition to the originally proposed extraction and injection well locations in the southern portion of the site, one new extraction well and four injection wells were proposed in the area of monitoring well EMW-13 to create a groundwater mound to divert the TCE plume toward the proposed extraction well. EPA requested further information before completely agreeing to the proposed extraction/injection wells located near EMW-13. The proposed CPT program outlined by ICF would identify if the TCE plume was beyond (in the downgradient direction) the monitoring wells along the southern boundary of PGA.

The pilot hole boring program was scheduled to begin during mid-April, but because of licensing and registration requirements for contractors to work within the state of Arizona, the plan was modified to hire a drilling contractor licensed in Arizona and to use hollow-stem auger and split spoon sampling techniques. This phase of the program precluded the actual Phase II extraction/injection well installation that was scheduled to begin in early May 1991. The revised schedule for the pilot borings was slated to begin May 6, 1991, followed by installation of extraction/injection wells.

Prior to Phase II work commencing, Goodyear and ICF were informed by EPA of potential petroleum hydrocarbon contamination in the groundwater near the proposed extraction well locations in the northern portion of the project site. This information was presented to Goodyear and ICF during the April 1991 meeting in San Francisco, California. The Phase II plan was then further modified, and the pilot hole borings located north of pilot boring PB-27/I-19 were temporarily withdrawn from the scope of work. The program continued in the southern portion of the site as planned.

3.2 PILOT HOLE BORING PROGRAM

Heber Mining and Exploration Company (Phoenix, Arizona) was contracted to perform the drilling of the pilot borings and to collect split spoon soil samples at intervals specified by ICF. Work commenced on May 9, 1991 and the first phase was completed May 23, 1991. The initial plan was to auger and sample 29 boring locations; however, because of potential petroleum hydrocarbon contamination in the northern portion of PGA, the Pilot Hole Boring Program was modified to work only in the southern portion of PGA. This part of the program did not extend any further north than where existing buildings are located (PB-27/I-19 area, refer to figure 20). Future work in the northern portion is being considered, and ICF is drafting a work plan at Goodyear's request for the northern PGA site.

Geraghty and Miller, Inc. (Phoenix, Arizona) is currently assessing the petroleum hydrocarbon contamination and proposing future investigations at other localities at the PGA site. G&M's investigations revealed petroleum hydrocarbon contamination in the soil and groundwater in the northern portion of the site between monitoring wells EMW-16 and EMW-10. Any future extraction wells in this location will need to be carefully sited and monitoring wells installed to ensure that petroleum hydrocarbons are not extracted and treated in the air stripping plant. ICF is preparing a work plan to address future Phase II work in the northern portion of the site.

Proposed Cone Penetrometer Test Locations

Phase II

Phoenix Goodyear Airport Site

Legend

- ▲ CPT Location
- ⊙ CPT and Well Location



Figure 19

Proposed Well Locations

Phase II

Phoenix Goodyear Airport Site

Legend

- Extraction Wells
- Injection Wells

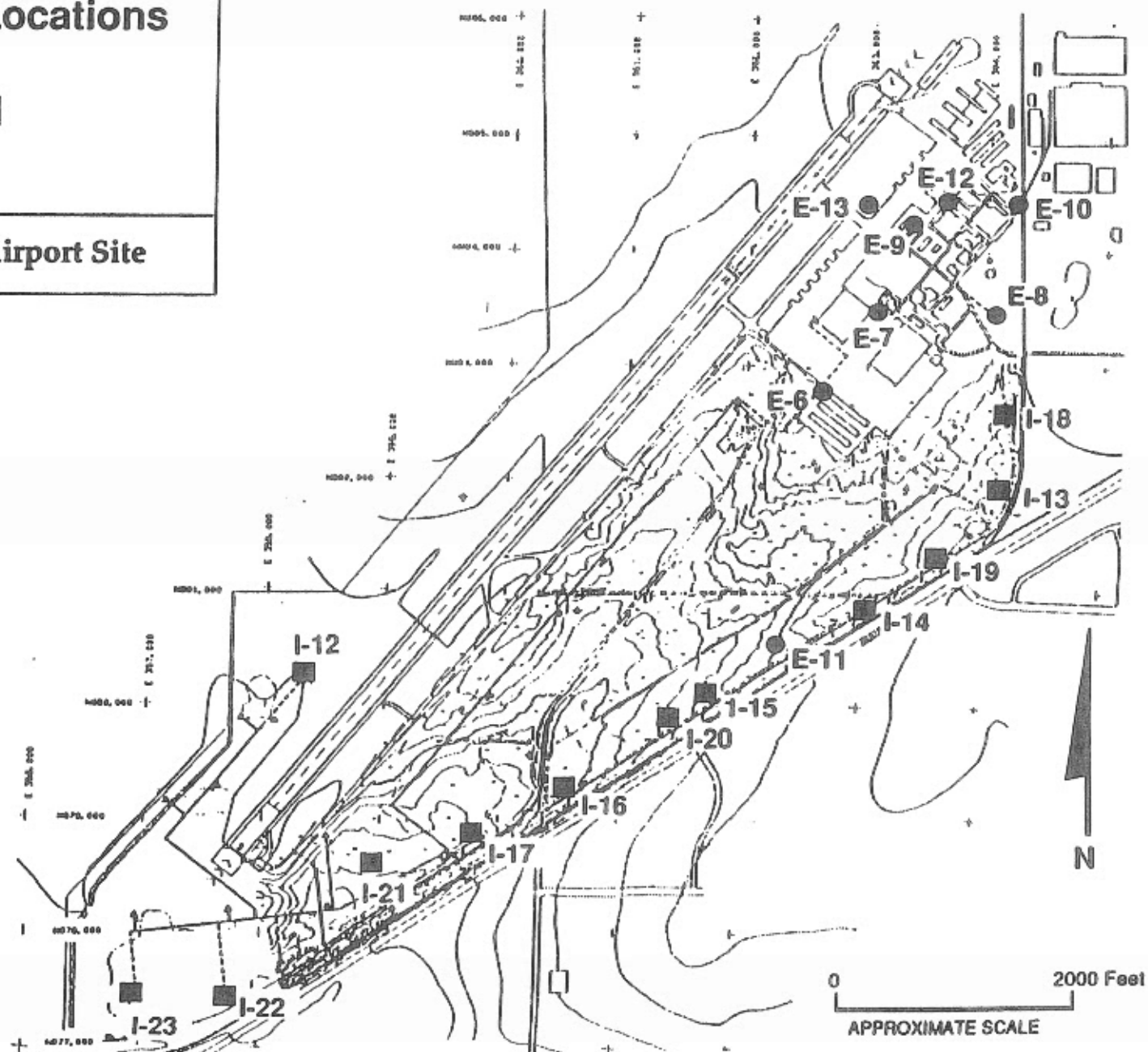


Figure 20

During the Phase II Pilot Hole Boring Program, 18 pilot borings were drilled and sampled. Sampling consisted of soil and water samples for grain-size analysis and groundwater chemistry. Soil samples were collected at three intervals based on the proposed extraction/injection well screen depths. For the injection wells, three soil samples were randomly collected and composited within the proposed screened interval (20 to 60 below ground surface) and sent to Western Technologies, Inc. (Phoenix, Arizona) for grain-size analysis. The same procedure was used in selecting the soil samples from the proposed extraction well. The soil samples were collected between 40 and 110 feet below ground surface.

Groundwater samples were collected after the pilot borings were terminated. The depth of the pilot borings vary according to geologic conditions and did not exceed 110 feet in depth. Table 4 presents a summary of the pilot holes with total boring depth and depth to groundwater. Water samples were collected using disposable teflon bailers modified to collect groundwater at depth (similar to a point source bailer). The bailers were weighted, and the top of the bailer was modified to allow water to flow freely through as the bailer was lowered into the boring. This procedure was done because TCE is a volatile organic and the drilling procedures are anticipated to create turbid groundwater conditions, thus volatilizing TCE (if present) and reducing the concentrations. Modifying the bailers would enable the sampler to retrieve groundwater near the bottom of the boring, therefore obtaining a more representative sample than if collected near the water table. The results obtained, along with the geologic data, will be used to determine the location of future extraction/injection wells at PGA.

4.0 SUMMARY AND FINDINGS FROM THE PILOT HOLE BORING PROGRAM

4.1 SIEVE/GRAIN ANALYSES

Sieve analysis was performed on soil samples collected from the pilot hole borings. Sieve analysis allows for the design of the screened interval in the extraction/injection wells. Goodyear requested that .040 screen interval casing that was purchased during Phase I be utilized. Therefore, the sieve analysis will be used to determine filter pack size.

The grain size plots in Appendix B illustrate that the soil samples contain a large percentage of fine material. Each of the grain size plots have two grain size curves. Originally the results from the lab were plotted and reviewed. Because of the excessive fine material in the samples, the coarsest material was eliminated, and the percentages passing through the sieves were recalculated. The coarsest material (3/8-inch and larger) was deleted because this coarse material does not present a problem in the filter pack design. Based on preliminary review of the sieve analysis and the pre-determined slot size for the extraction wells, there will be a fine-grained passing through the screened interval.

4.2 CHEMICAL ANALYSIS OF GROUNDWATER SAMPLES

Groundwater samples were collected in all pilot borings that extended below the groundwater table. Groundwater was encountered approximately at the 50 to 55-foot depth below ground surface. Table 5 contains a summary of the laboratory analysis from Analytical Technology Inc. The methods used for analysis included EPA method 601/602 for volatile organics and the modified EPA method 8015 for petroleum hydrocarbons. ICF wanted to verify if petroleum hydrocarbon

TABLE 4					
PB #	BORING DATE	Pilot	Boring	Summary	
		BORING DEPTH	WATER DEPTH	GROUT DEPTH	WELL SITE
5	Suspended				E-10
6	Suspended				E-06
7	Suspended				
8	Suspended				E-08
9	Suspended				E-07
10	Suspended				
11	Suspended				
12	Suspended				I-13
13	May 10-91	107	57	28	I-14
14	May 16-91	89	51	40	
15	May 13-91	107	51	18	
16	May 21-91	107	47	52	
17	May 09-91	107	53	30	E-11
18	May 17-91	107	45	40	
19	May 20-91	43	--	37	
19	May 20-91	47	--	35	
20	May 20-91	102	54	62	
21	May 13-91	97	56	2	I-15
22	May 15-91	99	40	0	I-16
23	May 15-91	14	--	0	I-17
23	May 15-91	28	20	16	I-17
24	May 23-91	67	45	37	I-12
25	Suspended				
26	Suspended				I-18
27	May 15-91	97	55	3	I-19
28	May 14-91	107	56	4	I-20
29	May 22-91	60	40	29	I-21

TABLE 5. PHOENIX-GOODYEAR AIRPORT - WATER ANALYSES

SAMPLE NUMBER	03761-PB13-GW1	03761-TB14-GW1	03761-PB15-GW1	03761-PB16-GW1	03761-PB17-GW1
SAMPLE LOCATION	PB-13	PB-14	PB-15	PB-16	PB-17
LABORATORY NUMBER	10568301	10578501	10571801	10583101	10566001
DATE SAMPLED	5/10/91	5/16/91	5/13/91	5/21/91	5/9/91
UNIT	ug/L	ug/L	ug/L	ug/L	ug/L
VOLATILE ORGANICS - EPA 601/602					
BENZENE	0.5 N	0.5 N	0.6	0.5 N	0.5 N
BROMODICHLOROMETHANE	0.2 N	0.2	0.2 N	0.2 N	0.9
BROMOFORM	0.2 N	0.2 N	0.2 N	0.2 N	0.2 N
BROMOMETHANE	0.2 N	0.2 N	0.2 N	0.2 N	0.2 N
CARBON TETRACHLORIDE	0.2 N	0.2 N	0.2 N	0.3	0.2 N
CHLOROBENZENE	0.5 N	0.5 N	0.5 N	0.5 N	0.5 N
CHLOROETHANE	0.2 N	0.2 N	0.2 N	0.2 N	0.2 N
CHLOROFORM	3.1	1.5	1.0	3.3	3.9
CHLOROMETHANE	0.2 N	0.2 N	0.2 N	0.2 N	0.2 N
DIBROMOCHLOROMETHANE	0.2 N	0.3	0.2 N	0.2 N	0.6
2-CHLOROETHYL VINYL ETHER	0.5 N	0.5 N	0.5 N	0.5 N	0.5 N
1,3-DICHLOROBENZENE	0.5 N	0.5 N	0.5 N	0.5 N	0.5 N
1,2 & 1,4-DICHLOROBENZENE	0.5 N	0.5 N	0.5 N	0.5 N	0.5 N
DICHLORODIFLUOROMETHANE	0.2 N	0.2 N	0.2 N	0.2 N	0.2 N
1,1-DICHLOROETHANE	0.2 N	0.3	1.9	0.2 N	0.2 N
1,2-DICHLOROETHANE	0.2 N	0.2 N	0.5	0.2	0.2 N
1,1-DICHLOROETHENE	2.4	1.6	12.8	3.0	3.5
1,2-DICHLOROETHENE (TOTAL)	0.2 N	0.2 N	0.6	0.2 N	0.2 N
1,2-DICHLOROPROPANE	0.2 N	0.2 N	0.2 N	0.2 N	1.4
CIS-1,2-DICHLOROPROPENE	0.2 N	0.2 N	0.2 N	0.2 N	0.2 N
TRANS-1,3-DICHLOROPROPENE	0.2 N	0.2 N	0.2 N	0.2 N	0.2 N
ETHYLBENZENE	0.5 N	0.5 N	0.5 N	0.5 N	0.5 N
METHYLENE CHLORIDE	2.0 N	2.0 N	2.0 N	2.0 N	2.0 N
1,1,2,2-TETRACHLOROETHANE	0.2 N	0.2 N	0.2 N	0.2 N	0.2 N
TETRACHLOROETHENE	2.6	0.2 N	1.6	0.4	3.8
TOLUENE	0.5 N	0.5 N	0.5 N	0.5 N	1.5
1,1,1-TRICHLOROETHANE	3.7	0.2 N	0.7	0.5	21.4
1,1,2-TRICHLOROETHANE	0.2 N	0.2 N	0.2 N	0.2 N	0.2 N
TRICHLOROETHENE	8.7	3.7	54.8	220.0	29.2
TRICHLOROFLUOROMETHANE	0.5 N	0.5 N	0.5 N	0.2	0.5 N
VINYL CHLORIDE	0.2 N	0.2 N	0.2 N	0.2 N	0.2 N
TOTAL XYLENES	0.5 N	0.5 N	0.5 N	0.5 N	0.5 N
TRICHLOROTRIFLUOROETHANE	2.0 N	2.0 N	2.2	2.0 N	2.0 N
FUEL HYDROCARBONS, (mg/L)	5.0 N	5.0 N	5.0 N	5.0 N	5.0 N
MODIFIED EPA METHOD 8015					

TABLE 5 (cont.) PHOENIX-GOODYEAR AIRPORT - WATER ANALYSES

	SAMPLE NUMBER	03761-TB18-GW1	03761-PB20-GW1	03761-PB21-GW1	03761-PB22-GW1	03761-PB23-GW1
	SAMPLE LOCATION	PB-18	PB-20	PB-21	PB-22	PB-27
	LABORATORY NUMBER	10578502	10582001	10571802	10577101	10573801
	DATE SAMPLED	5/16/91	5/20/91	5/13/91	5/16/91	5/15/91
	UNIT	ug/L	ug/L	ug/L	ug/L	ug/L
VOLATILE ORGANICS - EPA 601/602						
BENZENE		0.5 M	0.8	0.5 M	0.5 M	0.5 M
BROMODICHLOROMETHANE		0.5	0.2 M	0.2 M	0.2 M	0.2 M
BROMOFORM		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
BROMOMETHANE		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
CARBON TETRACHLORIDE		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
CHLOROBENZENE		0.5 M	0.5 M	0.5 M	0.5 M	0.5 M
CHLOROETHANE		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
CHLOROFORM		0.8	3.8	2.2	0.8	1.0
CHLOROMETHANE		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
DIBROMOCHLOROMETHANE		0.5	0.2 M	0.2 M	0.2 M	0.2 M
2-CHLOROETHYL VINYL ETHER		0.5 M	0.5 M	0.5 M	0.5 M	0.5 M
1,3-DICHLOROBENZENE		0.5 M	0.5 M	0.5 M	0.5 M	0.5 M
1,2 & 1,4-DICHLOROBENZENE		0.5 M	0.5 M	0.5 M	0.5 M	0.5 M
DICHLOROFLUOROMETHANE		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
1,1-DICHLOROETHANE		0.2 M	0.2 M	0.6	0.2 M	0.2 M
1,2-DICHLOROETHANE		0.2 M	0.2 M	0.2	0.2 M	0.2 M
1,1-DICHLOROETHENE		0.2 M	0.2 M	2.1	0.2 M	2.2
1,2-DICHLOROETHENE (TOTAL)		0.2 M	0.2 M	0.3	0.2 M	0.2 M
1,2-DICHLOROPROPANE		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
CIS-1,2-DICHLOROPROPENE		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
TRANS-1,3-DICHLOROPROPENE		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
ETHYLBENZENE		0.5 M	0.5 M	0.5 M	0.5 M	0.5 M
METHYLENE CHLORIDE		2.0 M	2.0 M	2.0 M	2.0 M	2.0 M
1,1,2,2-TETRACHLOROETHANE		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
TETRACHLOROETHENE		0.2 M	0.3	0.8	0.5 M	0.6
TOLUENE		0.5 M	0.5 M	0.5 M	0.5 M	0.5 M
1,1,1-TRICHLOROETHANE		0.2 M	0.2 M	1.2	0.2 M	0.2 M
1,1,2-TRICHLOROETHANE		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
TRICHLOROETHENE		2.2	44.0	135.0	1.2	12.2
TRICHLOROFLUOROMETHANE		0.5 M	0.5 M	0.5 M	0.5 M	0.5 M
VINYL CHLORIDE		0.2 M	0.2 M	0.2 M	0.2 M	0.2 M
TOTAL XYLENES		0.5 M	0.5	0.5 M	0.5 M	0.5 M
TRICHLOROTRIFLUOROETHANE		2.0 M	2.0 M	2.0 M	2.0 M	2.0 M
FUEL HYDROCARBONS, (mg/L)		5.0 M	5.0 M	5.0 M	5.0 M	5.0 M
MODIFIED EPA METHOD 8015						

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TABLE 5 (cont.) PHOENIX-GOODYEAR AIRPORT - WATER ANALYSES

	SAMPLE NUMBER SAMPLE LOCATION LABORATORY NUMBER DATE SAMPLED UNIT	03761-PB24-GW1 PB-24 10588501 5/23/91 ug/L	03761-PB28-GW1 PB-28 10571803 5/13/91 ug/L	03761-PB29-GW1 PB-29 10586001 5/22/91 ug/L	COMPOSITE SOIL PB-13/PB-17 10568305 5/10/91 mg/kg
VOLATILE ORGANICS - EPA 601/602					
	BENZENE	0.5 N	0.6	0.9	0.025 N
	BROMODICHLOROMETHANE	0.2 N	0.2 N	0.2 N	0.010 N
	BROMOFORM	0.2 N	0.2 N	0.2 N	0.010 N
	BROMOMETHANE	0.2 N	0.2 N	0.2 N	0.010 N
	CARBON TETRACHLORIDE	0.2 N	0.2 N	0.2 N	0.010 N
	CHLOROBENZENE	0.5 N	0.5 N	0.5 N	0.025 N
	CHLOROETHANE	0.2 N	0.2 N	0.2 N	0.010 N
	CHLOROFORM	0.2 N	0.4	5.8	0.010 N
	CHLOROMETHANE	0.2 N	0.2 N	0.2 N	0.010 N
	DIBROMOCHLOROMETHANE	0.2 N	0.2 N	0.2 N	0.010 N
	2-CHLOROETHYL VINYL ETHER	0.5 N	0.5 N	0.5 N	0.025 N
	1,3-DICHLOROBENZENE	0.5 N	0.5 N	0.5 N	0.025 N
	1,2 & 1,4-DICHLOROBENZENE	0.5 N	0.5 N	0.5 N	0.025 N
	DICHLORODIFLUOROMETHANE	0.2 N	0.2 N	0.2 N	0.010 N
	1,1-DICHLOROETHANE	0.2 N	0.2 N	0.2 N	0.010 N
34	1,2-DICHLOROETHANE	0.2 N	0.2 N	0.2 N	0.010 N
	1,1-DICHLOROETHENE	0.2 N	0.2 N	0.2 N	0.010 N
	1,2-DICHLOROETHENE (TOTAL)	0.2 N	0.2 N	0.2 N	0.010 N
	1,2-DICHLOROPROPANE	0.2 N	0.2 N	0.2 N	0.010 N
	CIS-1,2-DICHLOROPROPENE	0.2 N	0.2 N	0.2 N	0.010 N
	TRANS-1,3-DICHLOROPROPENE	0.2 N	0.2 N	0.2 N	0.010 N
	ETHYLBENZENE	0.5 N	0.5 N	0.5 N	0.025 N
	METHYLENE CHLORIDE	2.0 N	2.0 N	2.0 N	0.100 N
	1,1,2,2-TETRACHLOROETHANE	0.2 N	0.2 N	0.2 N	0.010 N
	TETRACHLOROETHENE	0.2 N	0.5	0.2 N	0.010 N
	TOLUENE	0.5 N	0.5 N	0.5 N	0.025 N
	1,1,1-TRICHLOROETHANE	0.2 N	0.6	0.2 N	0.010 N
	1,1,2-TRICHLOROETHANE	0.2 N	0.2 N	0.2 N	0.010 N
	TRICHLOROETHENE	0.2 N	32.1	0.6	0.010 N
	TRICHLOROFLUOROMETHANE	0.5 N	0.5 N	0.5 N	0.100 N
	VINYL CHLORIDE	0.2 N	0.2 N	0.2 N	0.010 N
	TOTAL XYLENES	0.5 N	0.5 N	0.5 N	0.025 N
	TRICHLOROTRIFLUOROETHANE	2.0 N	2.0 N	2.0 N	0.010 N
	FUEL HYDROCARBONS, (mg/L) MODIFIED EPA METHOD 8015	5.0 N	5.0 N	5.0 N	5.0 N

contamination was in areas where future extraction wells were targeted. There were no petroleum hydrocarbons detected in the groundwater samples collected during this round of Phase II work.

The primary contaminant of concern is trichloroethene (TCE). The highest concentration of TCE detected in the groundwater samples collected during this program was 220 ppb. (PB-16-Figure 21). This location is within the TCE plume (refer to Figure 12) near the Phase I extraction wells. Groundwater samples collected from the pilot hole borings along the southerly boundary of PGA all contained concentrations of TCE. The highest value in this area was at PB-21/I-15 location. The TCE concentration at this location is 135 ppb. TCE concentrations obtained during the Phase II program varied throughout the site and do not necessarily correspond to the TCE isopleth map. This could be another reasonable explanation supporting the buried stream channel theory.

Other volatile organics encountered during the Phase II program that exceed Maximum Level Drinking Water Standards are 1,1-dichloroethene (PB-15, 12.8 ppb). Table 6 lists all organics detected in the water samples collected.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

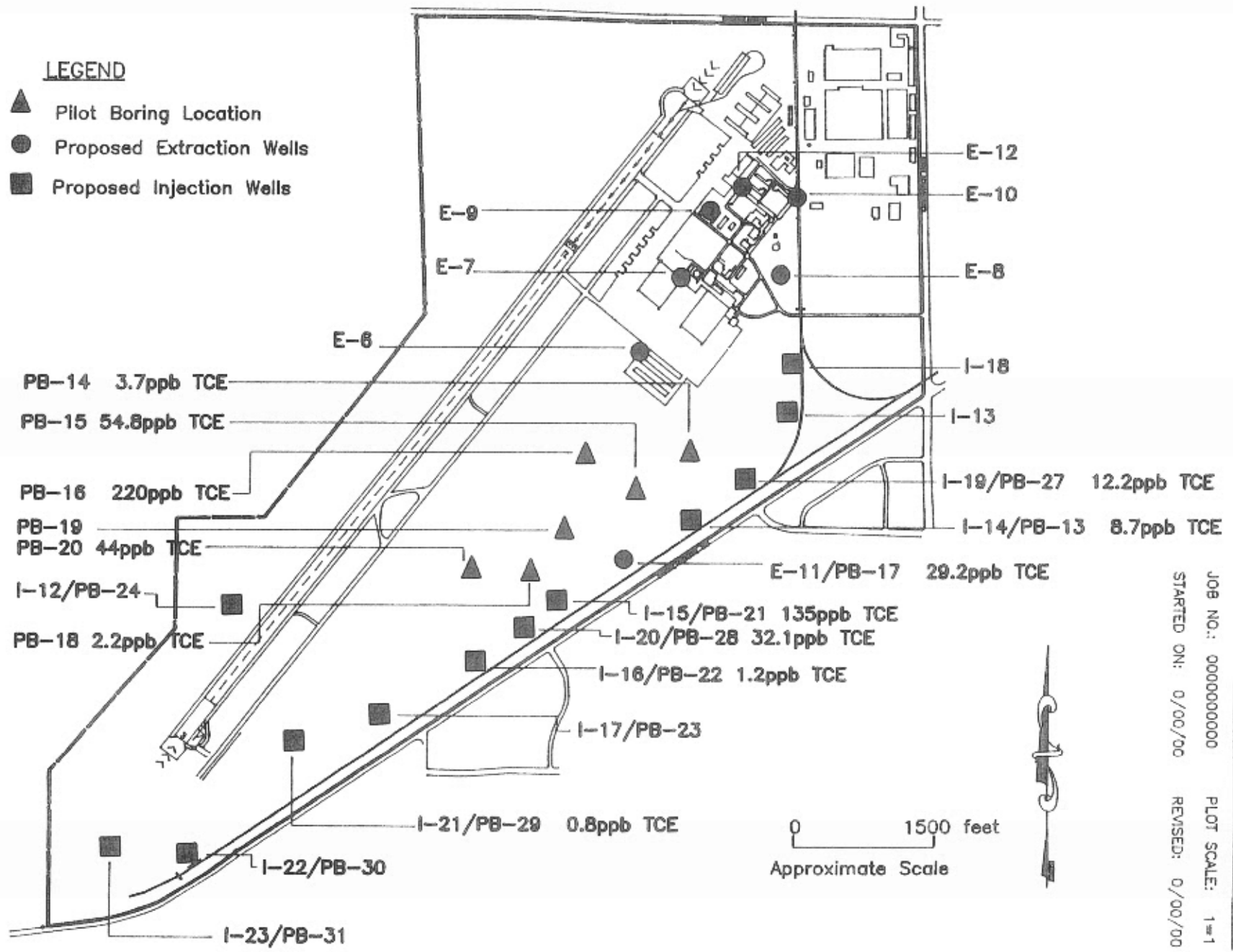
The Phase II Pilot Hole Program initiated in May 1991 and focusing on the southern portion of the site revealed the following facts:

1) The geology of PGA site is highly complex resulting from the deposition of sediments from braided stream channels of the Agua Fria and Gila River systems. The sediments are derived from nearby mountain ranges uplifted by block faulting. The uplifted bedrock material is weathered by water and transported downslope, then deposited as alluvial fans, and further transported downgradient from the source area in stream and river systems. Through geologic time, these materials were reworked and buried by further stream sedimentation, creating a very complex geologic and hydrogeologic environment. Groundwater flow through the sediments can be preferentially oriented in buried stream channels and flow in a stratigraphically down-dip direction that may be oriented differently than the hydraulic gradient. Contaminants can be transported along these channels, which have higher hydraulic conductivity values than the surrounding finer-grained sediments.

2) Evidence from previous investigations and the Phase I and II program indicate the TCE plume is trending in a southerly-southwesterly direction, and is offset to the south from the regional hydraulic gradient direction. The regional hydraulic gradient is toward the west-southerly direction.

3) TCE was detected in all the groundwater samples collected for the pilot hole borings except PB-24/I-12, which is the only location where TCE was not detected. The other borings where TCE was not indicated were borings that did not penetrate the groundwater. This information confirms that TCE concentrations in excess of 100 ppb are located to the south of monitoring wells EMW-13, E-3, and E-4, all of which are very near the southerly property boundary of PGA. The data suggests the possible scenario that the TCE plume could be extended to off-site areas to the south. At this time, the leading edge of the plume cannot be determined, but additional monitoring wells should be considered off-site, south of Highway 85. These wells should be placed within 500 feet of the highway to determine and detect potential contamination. If these wells show

JOB NO.: 0000000000 PLOT SCALE: 1"=1'
 STARTED ON: 0/00/00 REVISED: 0/00/00



PHOENIX GOODYEAR SUPERFUND SITE
 GOODYEAR, ARIZONA

ICF TECHNOLOGY INC.

PITTSBURGH, PA

Figure 21

DATE: 6/14/91
 SCALE: 1"=1500'

DR.:
 DWG. NO.:

TABLE 6. PHOENIX-GOODYEAR AIRPORT - VOLATILE ORGANICS DETECTED IN WATER SAMPLES.

SAMPLE LOCATION DATE SAMPLED UNIT	DETECTION LIMITS	MAX. LEVEL DRINKING WATER	PB-13	PB-14	PB-15	PB-16	PB-17	PB-18	PB-20	PB-21	PB-22	PB-27	PB-28	PB-29
			5/10/91	5/16/91	5/13/91	5/21/91	5/9/91	5/16/91	5/20/91	5/13/91	5/16/91	5/15/91	5/13/91	5/22/91
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOLATILE ORGANICS														
BENZENE	0.5	5.0	ND	ND	0.6	ND	ND	ND	0.8	ND	ND	ND	0.6	0.9
CARBON TETRACHLORIDE	0.2	5.0	ND	ND	ND	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	0.2		ND	0.3	1.9	ND	ND	ND	ND	0.6	ND	ND	ND	ND
1,2-DICHLOROETHANE	0.2	5.0	ND	ND	0.5	0.2	ND	ND	ND	0.2	ND	ND	ND	ND
1,1-DICHLOROETHENE	0.2	7.0	2.4	1.6	12.8	3.0	3.5	ND	ND	2.1	ND	2.2	ND	ND
1,2-DICHLOROETHENE (TOTAL)	0.2	70.0 *	ND	ND	0.6	ND	ND	ND	ND	0.3	ND	ND	ND	ND
1,2-DICHLOROPROPANE	0.2	5.0	ND	ND	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND
TETRACHLOROETHENE	0.2	5.0	2.6	ND	1.6	0.4	3.8	ND	0.3	0.8	ND	0.6	0.5	ND
TOLUENE	0.5	1000.0	ND	ND	ND	ND	1.5	ND	ND	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	0.2	200.0	3.7	ND	0.7	0.5	21.4	ND	ND	1.2	ND	ND	0.6	ND
TRICHLOROTRIFLUOROETHANE	2.0		ND	ND	2.2	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	0.2	5.0	8.7	3.7	54.8	220.0	29.2	2.2	44.0	135.0	1.2	12.2	32.1	0.8
TRICHLOROFLUOROMETHANE	0.5		ND	ND	ND	0.2	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL XYLENES	0.5	10000.0	ND	ND	ND	ND	ND	ND	0.5	ND	ND	ND	ND	ND
TRIHALOMETHANES														
		100.0	3.1	2.0	1.0	3.3	5.4	1.8	3.8	2.2	0.8	1.0	0.4	5.8
BROMODICHLOROMETHANE	0.2		ND	0.2	ND	ND	0.9	0.5	ND	ND	ND	ND	ND	ND
CHLOROFORM	0.2		3.1	1.5	1.0	3.3	3.9	0.8	3.8	2.2	0.8	1.0	0.4	5.8
DIBROMOCHLOROMETHANE	0.2		ND	0.3	ND	ND	0.6	0.5	ND	ND	ND	ND	ND	ND

* Max. level for cis-1,2-Dichloroethene. Max. level for trans-1,2-Dichloroethene is 100 ug/L

ND: Not Detected.

contamination, it will be necessary to install future monitoring wells further to the south to determine the leading edge of the plume.

4) Groundwater contour data overlayed with the TCE plume indicate the contaminant is not flowing along the regional hydraulic gradient. This data suggests that part of the TCE plume is flowing in zones of higher hydraulic conductivities that are oriented differently than the overall hydraulic gradient. The Subunit A of the Upper Alluvial Aquifer was previously interpreted to be a water table aquifer. While this may be true, the geologic evidence suggests there are semi-confining and confining layers throughout Subunit A which can cause complex flow paths in the aquifer, not necessarily in the hydraulically downgradient direction.

5) Pump test data from the extraction wells and previously installed monitoring wells vary throughout the site. The highest and lowest transmissivity values occur in the northern portion of the airport site, indicating that the hydrogeology is heterogeneous. Transmissivity values in the northern portion of PGA average around 33,000 gpd/ft. Hydraulic conductivity values average approximately 500 gpd/ft². Transmissivity values in the southern portion of the site average around 20,000 gpd/ft and hydraulic conductivity values average between 400-500 gpd/ft².

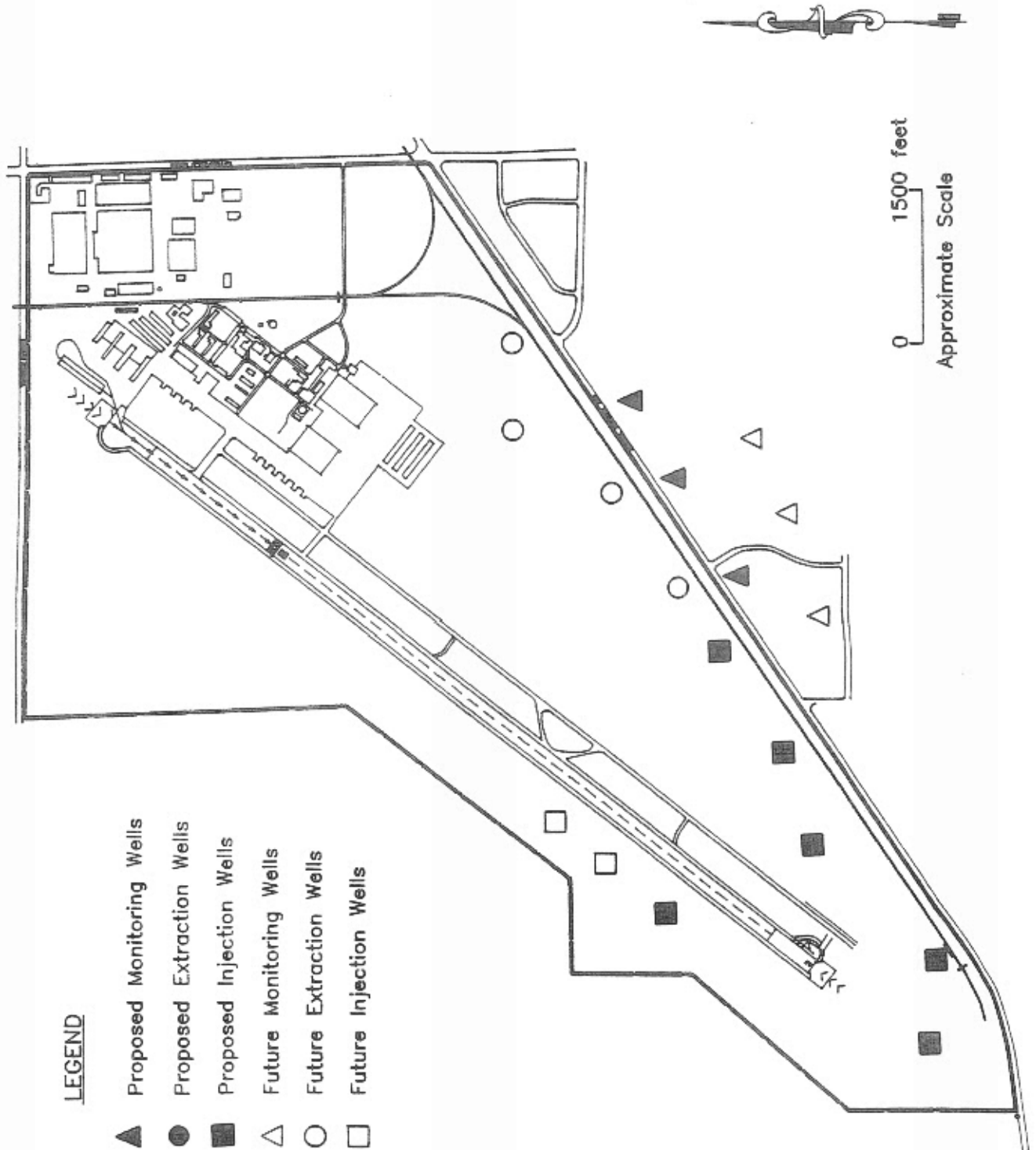
5.2 RECOMMENDATIONS

The information obtained during the Phase II Pilot Hole Boring Program and from previous investigations lead to the following recommendations:

1) Figure 22 indicates where addition monitoring wells should be located off-site and to the south of the PGA property. These additional monitoring wells will determine if the TCE plume has migrated off-site and to monitor the effects the existing and proposed extraction system will have on the TCE plume. These monitoring wells will be screened 10 feet above the water table to 110 feet below grade (or to the base of Subunit A).

2) Further investigation is recommended for the area around monitoring well EMW-13 and off-site to the south. ICF is exploring the feasibility of surface geophysical methods to determine buried stream channels.

3) Figure 22 illustrates the areas where future extraction wells may have to be located in the southern portion of PGA to extract TCE contaminated groundwater and to contain the TCE plume on-site. Four extraction well locations are proposed. These locations are based on the best geologic conditions encountered during the pilot hole borings and groundwater samples collected and analyzed for volatile organics and petroleum hydrocarbons. The extraction wells are located in the area with the highest TCE concentrations along the southerly boundary. Extraction well locations were determined based on the best information available to date. The regional hydraulic gradient indicates that the predicted groundwater flow is toward the extraction system; the geology, however, indicates preferential pathways in north-south trending buried stream channels that may direct TCE contamination off-site.



PHOENIX GOODYEAR SUPERFUND SITE
 GOODYEAR ARIZONA

ICF TECHNOLOGY INC.
 PITTSBURGH, PA

Figure 22

DATE: 6/14/91

DR.:

SCALE: 1"=1500'

DWG. NO.:

4) Figure 22 also illustrates the areas where injection wells in the southern portion of PGA may have to be located. Six injection well locations are proposed, again based on the geologic conditions and groundwater samples analyzed for volatile organics and the capacity needed for reinjecting treated groundwater. The injection wells are located in areas where the geology should be conducive for the purpose of injecting treated groundwater and areas where TCE concentrations were below the clean-up levels indicated in the Consent Decree. These injection wells are part of the original Phase II program and will be completed in accordance with the Injection Well Specifications (ICF, 1991). The design of the injection wells as specified in the Injection Well Specifications should be capable of handling the amount of water extracted. Future injection wells may be necessary upon completion of the Northern extraction wells.

5) An updated groundwater model should be incorporated in the next phase. The model needs to incorporate new geologic and hydrogeologic data collected during Phase I and Phase II activities to confirm how the proposed E/I system will contain and extract the TCE plume.

6) Observation wells will be installed adjacent to each extraction/ injection well installed and will be constructed as were observation wells in Phase I. At a minimum, one observation well will be installed adjacent to each injection/extraction well completed.

7) Additional data may be necessary to further evaluate the geologic and hydrogeologic conditions. All future extraction/injection well sites that were not a part of the completed Phase II program will have pilot borings, soil samples and groundwater sampling performed prior to installation of extraction and injection wells. Siting of all future extraction/injection well will be based on the best geologic conditions (obtained from pilot boring information), groundwater chemical analysis, and any other data obtained through further investigations. Observation wells will be installed after completion of the pilot borings.

5.3 SCHEDULE OF RECOMMENDATIONS

1) Install groundwater monitoring wells off-site and south of monitoring well EMW-13 as shown in Figure 22. Groundwater samples will be collected for chemical analysis with 24-hour turnaround time on lab results. If these wells show TCE contamination, further offsite wells (to the south) may be necessary.

2) Install proposed injection wells as illustrated in Figure 22.

3) Future extraction and injection wells may need to be installed as illustrated in Figure 22. These wells will be installed in locations where geologic conditions are favorable and where TCE concentrations are the highest. These extraction wells will contain and reduce off-site contamination.

Optional Recommendations

1) Further delineation of subsurface stream channels near EMW-13 area could be accomplished using surface geophysical methods. This could be performed concurrently with monitoring well and injection well installations.

2) Update the groundwater model using new data from Phase I and Phase II work completed at this time. Pump test data, groundwater elevations, TCE concentrations, and reducing pump test data will be evaluated for incorporating into the groundwater model.

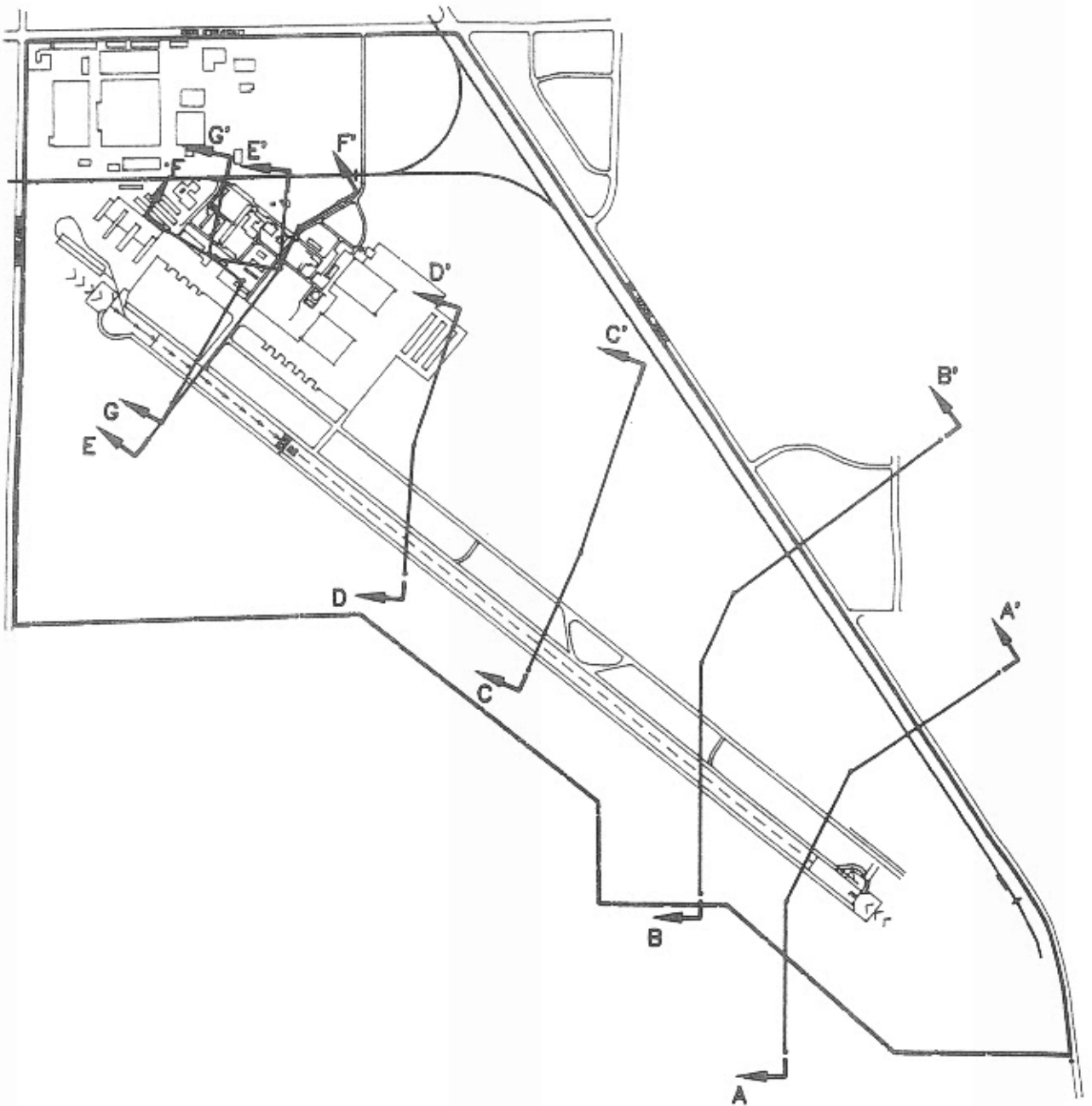
Implementation of these recommendations can proceed with concurrence from Goodyear and EPA.

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APPENDIX A
Geologic Cross-Sections

JOB NO.: 0000000000 PLOT SCALE: 1=1
STARTED ON: 0/00/00 REVISED: 0/00/00



PHOENIX GOODYEAR SUPERFUND SITE
GOODYEAR ARIZONA

ICF TECHNOLOGY INC.
PITTSBURGH, PA

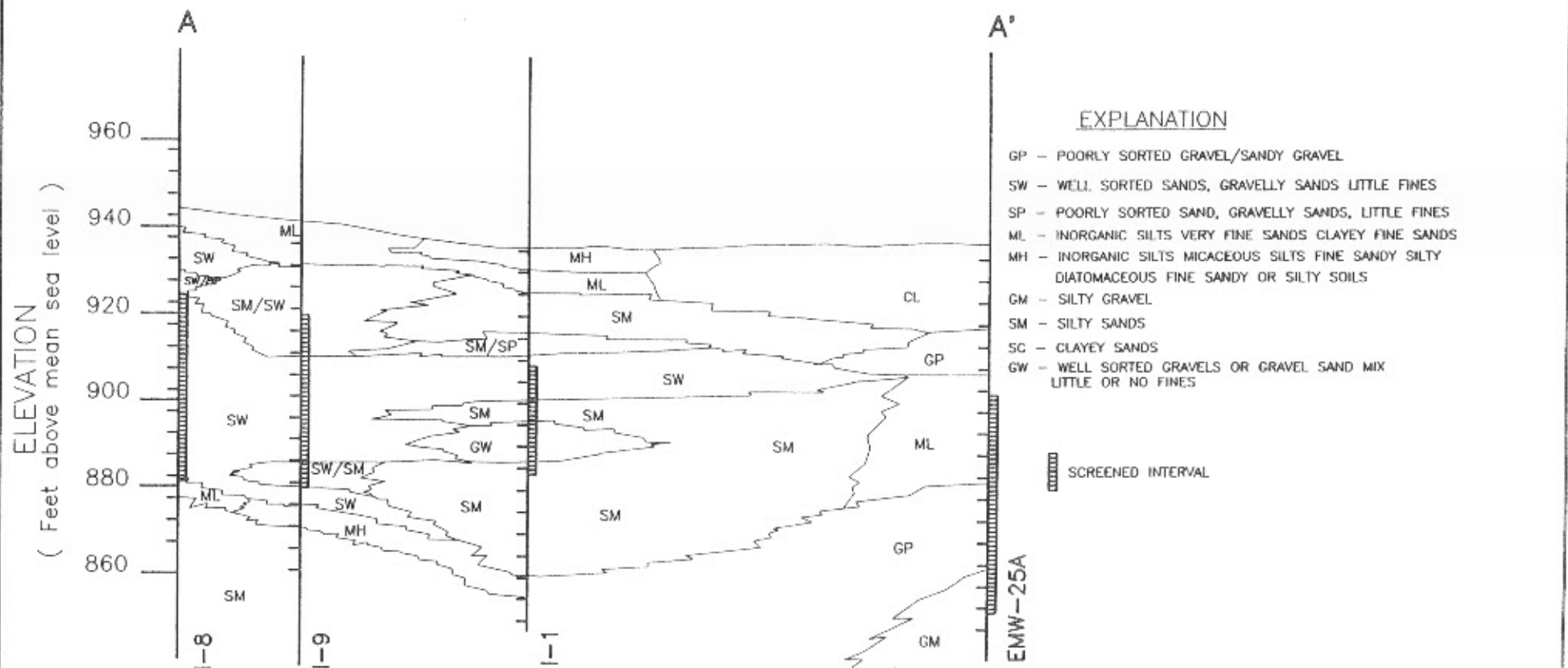
DATE: 6/14/91

DR.:

SCALE: 1"=1500'

DWG. NO.:

JOB NO.: 000000000 PLOT SCALE: 1"=1'
 STARTED ON: 0/00/00 REVISED: 0/00/00



PHOENIX GOODYEAR SUPERFUND SITE
 GOODYEAR ARIZONA

CROSS SECTION A-A'

ICF TECHNOLOGY INC.
 PITTSBURGH, PA

DATE: 6/14/91

DR.:

SCALE: H 1"=400' V 1"=20'

DWG. NO.

GP - POORLY SORTED GRAVEL/SANDY GRAVEL
 SW - WELL SORTED SANDS, GRAVELLY SANDS LITTLE FINES
 CL - INORGANIC CLAYS GRAVELLY CLAYS SILTY CLAY

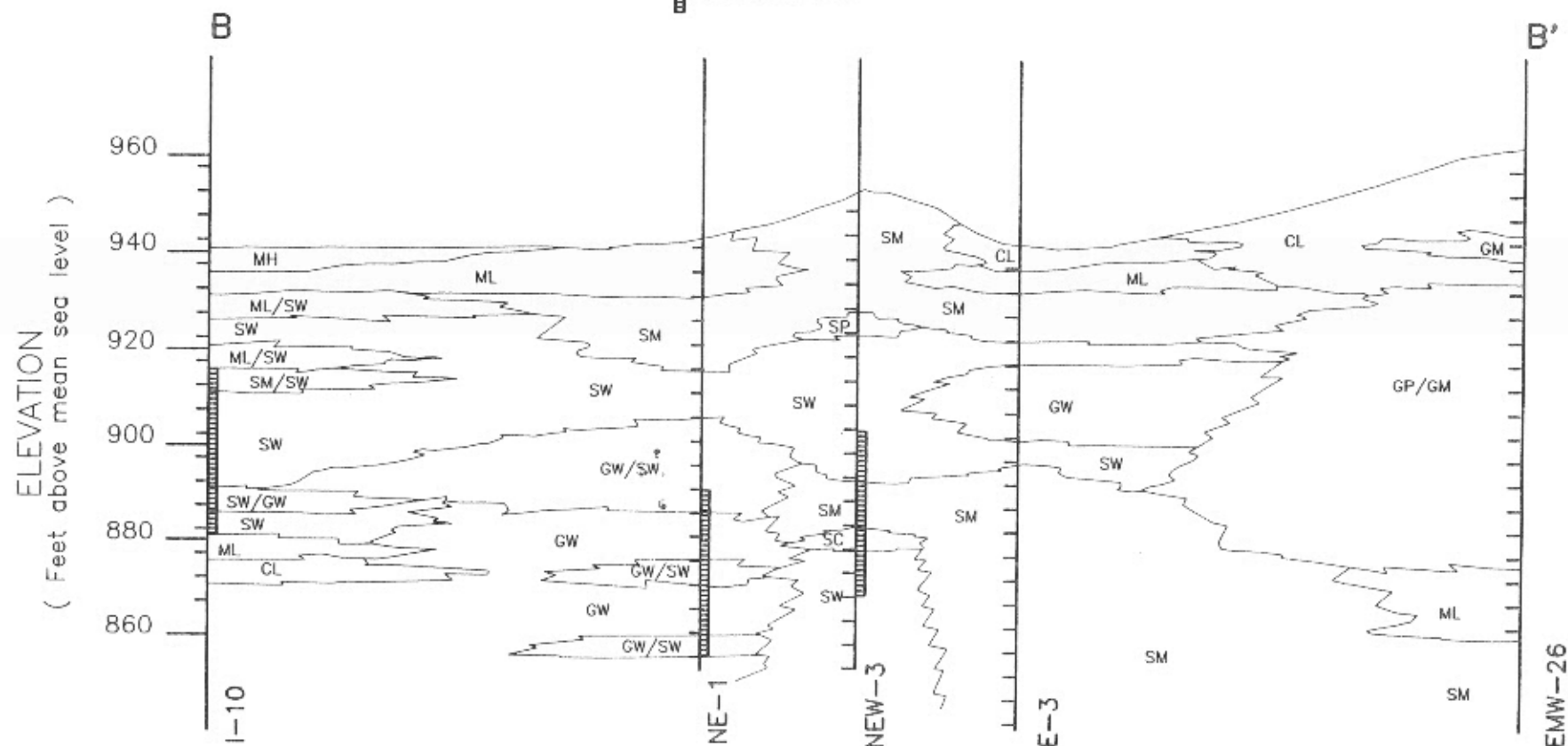
EXPLANATION

GM - SILTY GRAVEL
 SM - SILTY SANDS
 SC - CLAYEY SANDS

SP - POORLY SORTED SAND, GRAVELLY SANDS, LITTLE FINES
 ML - INORGANIC SILTS VERY FINE SANDS CLAYEY FINE SANDS
 MH - INORGANIC SILTS MICACEOUS SILTS FINE SANDY SILTY

SCREENED INTERVAL

JOB NO.: 000000000 PLOT SCALE: 1"=1'
 STARTED ON: 0/00/00 REVISED: 0/00/00



PHOENIX GOODYEAR SUPERFUND SITE
 GOODYEAR ARIZONA

ICF TECHNOLOGY INC.
 PITTSBURGH, PA

CROSS SECTION B-B'

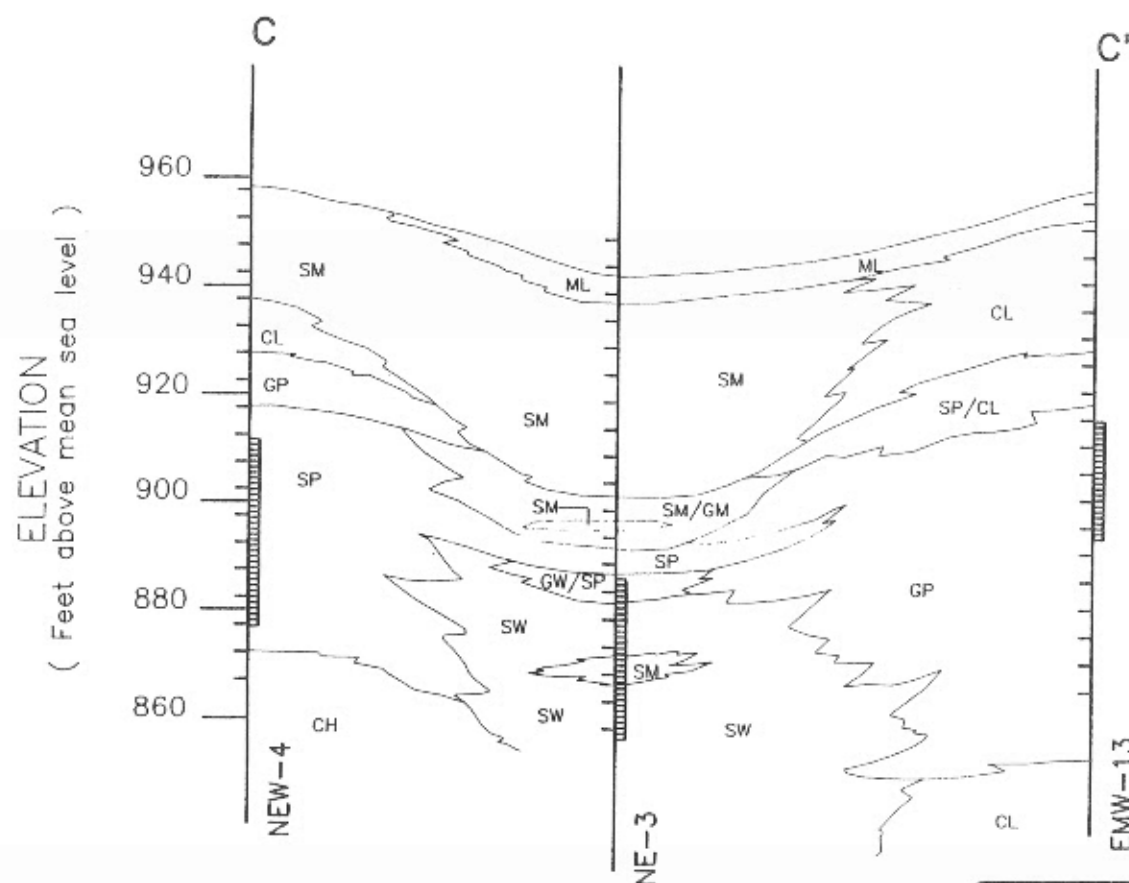
DATE: 6/14/91

DR.:


SCALE: H 1"=400' V 1"=20'

DWG. NO.

JOB NO.: 000000000 PLOT SCALE: 1=1
 STARTED ON: 0/00/00 REVISED: 0/00/00



EXPLANATION

- GP - POORLY SORTED GRAVEL/SANDY GRAVEL
- SW - WELL SORTED SANDS, GRAVELLY SANDS LITTLE FINES
- SP - POORLY SORTED SAND, GRAVELLY SANDS, LITTLE FINES
- ML - INORGANIC SILTS VERY FINE SANDS CLAYEY FINE SANDS
- MH - INORGANIC SILTS MICACEOUS SILTS FINE SANDY SILTY
- GM - SILTY GRAVEL
- SM - SILTY SANDS
- SC - CLAYEY SANDS
- CL - INORGANIC CLAYS, GRAVELLY CLAYS, SILTY CLAYS, SANDY CLAYS, MEDIUM/LOW PLASTICITY
- CH - INORGANIC CLAYS, HIGH PLASTICITY, FAT CLAYS
- GW - WELL SORTED GRAVELS, GRAVEL-SAND MIX, LITTLE OR NO FINES
-  SCREENED INTERVAL

PHOENIX GOODYEAR SUPERFUND SITE
 GOODYEAR ARIZONA

ICF TECHNOLOGY INC.
 PITTSBURGH, PA

CROSS SECTION C-C'

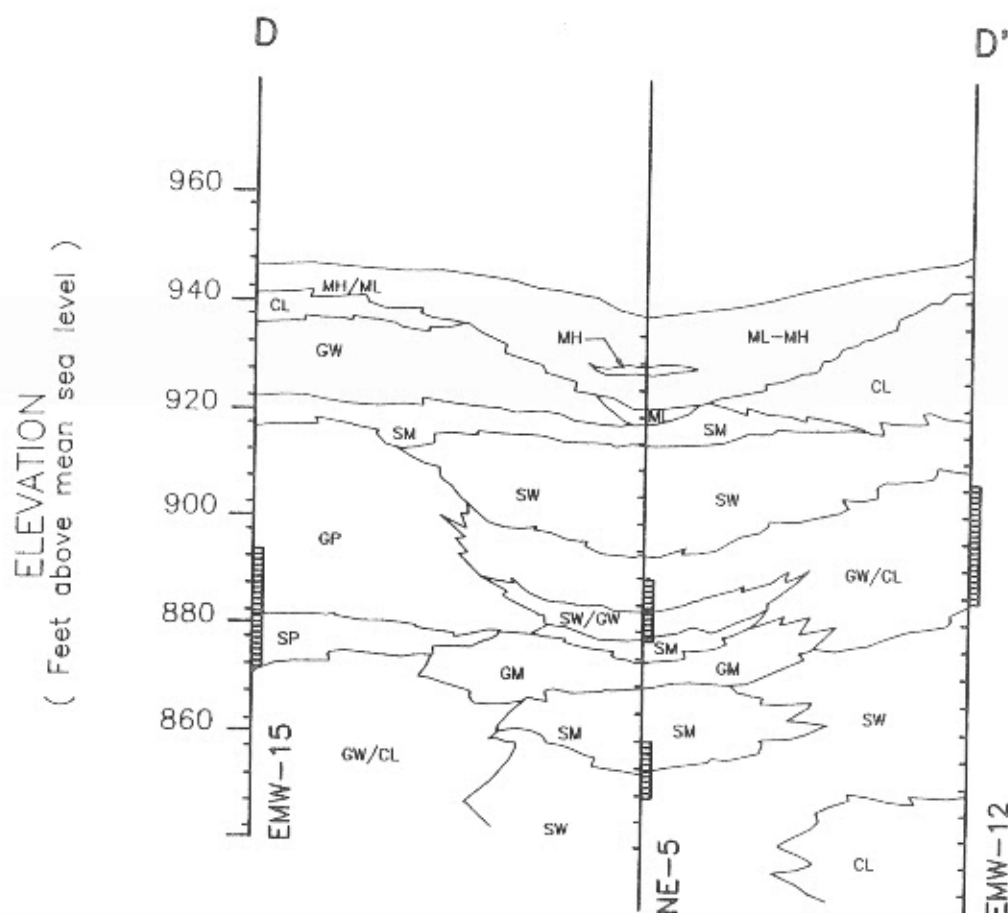
DATE: 6/14/91

DR.:

SCALE: H 1"=400' V 1"=20'

DWG. NO.

JOB NO.: 0000000000 PLOT SCALE: 1=1
 STARTED ON: 0/00/00 REVISED: 0/00/00



EXPLANATION

- GP - POORLY SORTED GRAVEL/SANDY GRAVEL
- SW - WELL SORTED SANDS, GRAVELLY SANDS LITTLE FINES
- SP - POORLY SORTED SAND, GRAVELLY SANDS, LITTLE FINES
- ML - INORGANIC SILTS VERY FINE SANDS CLAYEY FINE SANDS
- MH - INORGANIC SILTS MICACEOUS SILTS FINE SANDY SILTY
- GM - SILTY GRAVEL
- SM - SILTY SANDS
- SC - CLAYEY SANDS

SCREENED INTERVAL

PHOENIX GOODYEAR SUPERFUND SITE
 PHOENIX, ARIZONA

ICF TECHNOLOGY INC.
 PITTSBURGH, PA

CROSS SECTION D-D'

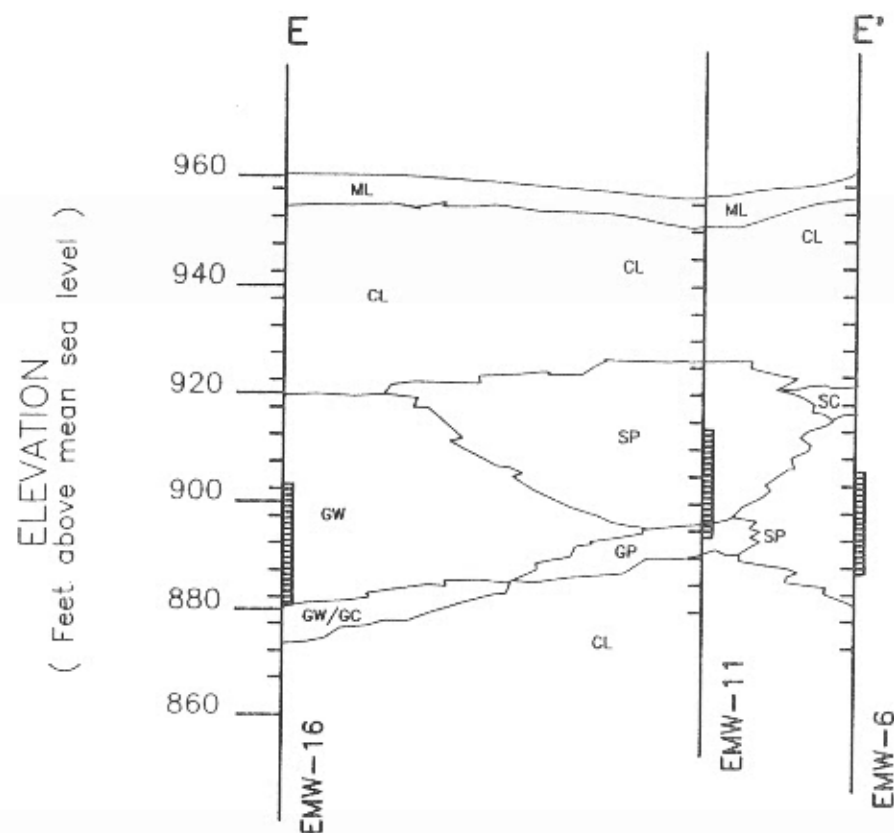
DATE: 8/14/91

DR.:

SCALE: H 1"=400' V 1"=20'

DWG. NO.

JOB NO.: 0000000000 PLOT SCALE: 1=1
 STARTED ON: 0/00/00 REVISED: 0/00/00



EXPLANATION

- GP - POORLY SORTED GRAVEL/SANDY GRAVEL
- SW - WELL SORTED SANDS, GRAVELLY SANDS LITTLE FINES
- SP - POORLY SORTED SAND, GRAVELLY SANDS, LITTLE FINES
- ML - INORGANIC SILTS VERY FINE SANDS CLAYEY FINE SANDS
- MH - INORGANIC SILTS MICACEOUS SILTS FINE SANDY SILTY
- GM - SILTY GRAVEL
- SM - SILTY SANDS
- SC - CLAYEY SANDS
- CL - INORGANIC CLAYS GRAVELLY CLAYS SILTY CLAY
- GW - WELL SORTED GRAVEL, GRAVEL SAND MIX LITTLE OR NO FINES

PHOENIX GOODYEAR SUPERFUND SITE
 GOODYEAR, ARIZONA

ICF TECHNOLOGY INC.
 PITTSBURGH, PA

CROSS SECTION E-E'

DATE: 6/14/91

DR:

SCALE: H 1"=400' V 1"=20' DWG. NO.

EXPLANATION

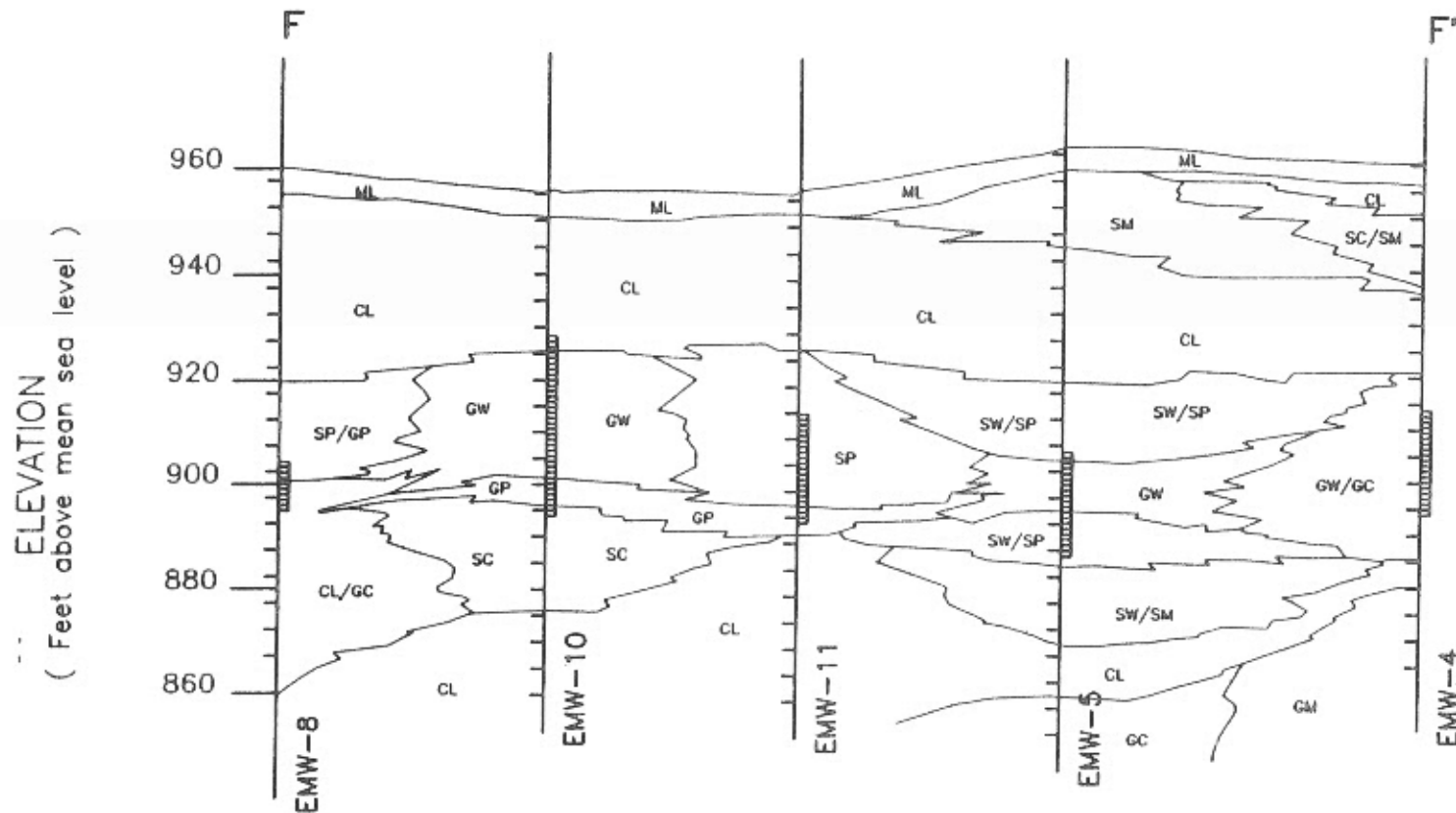
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SCREENED INTERVAL

GP - POORLY SORTED GRAVEL/SANDY GRAVEL
SW - WELL SORTED SANDS, GRAVELLY SANDS LITTLE FINES
CL - INORGANIC CLAYS GRAVELLY CLAYS SILTY CLAY
GM - SILTY GRAVEL

SP - POORLY SORTED SAND, GRAVELLY SANDS, LITTLE FINES
GW - WELL SORTED GRAVELS OR GRAVEL SAND MIX LITTLE OR NO FINES
SC - CLAYEY SANDS
GC - CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURE



PHOENIX GOODYEAR SUPERFUND SITE
GOODYEAR ARIZONA

ICF TECHNOLOGY INC.
PITTSBURGH, PA

CROSS SECTION F-F'

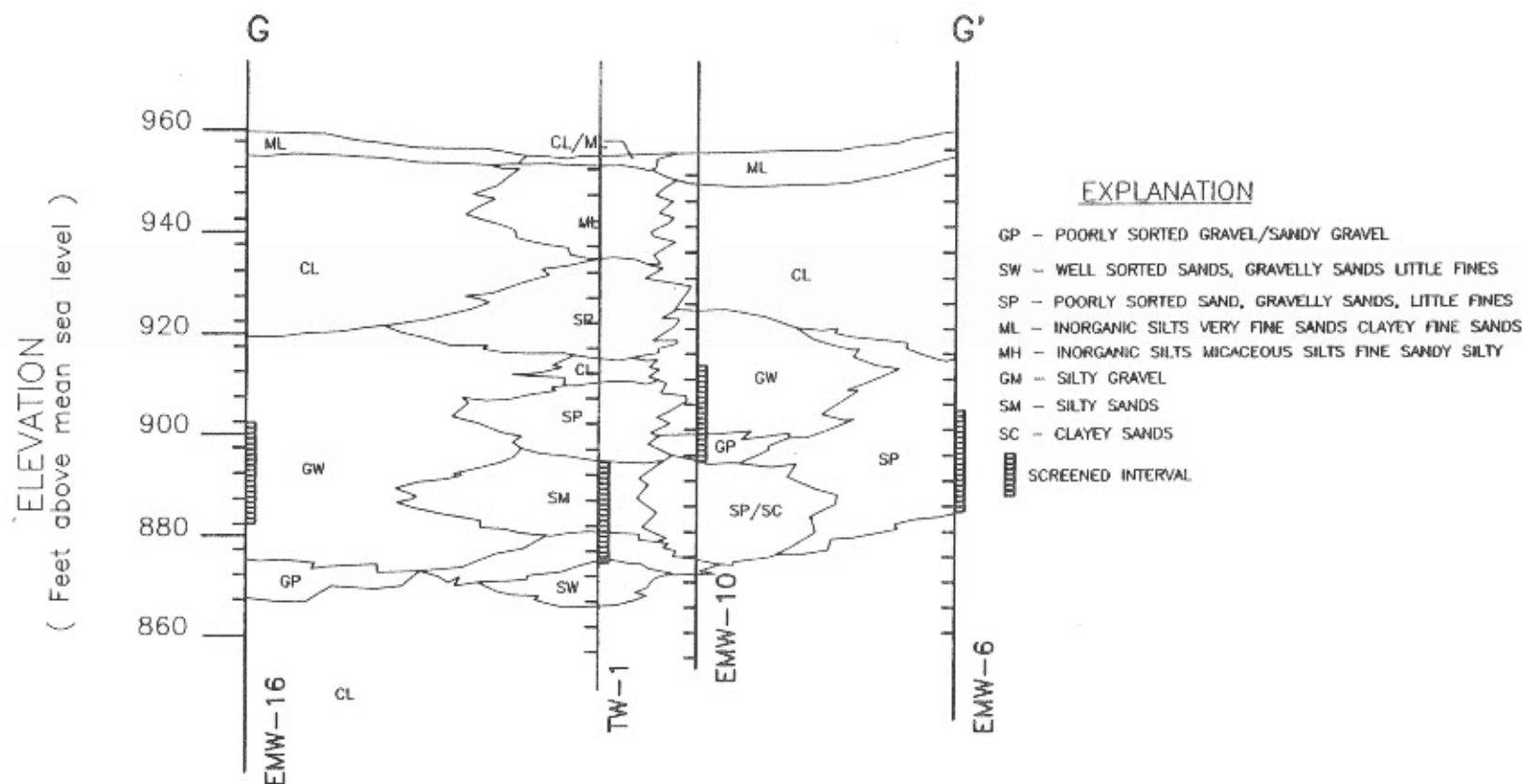
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DWG. NO.

JOB NO.: 0000000000 PLOT SCALE: 1"=1'
 STARTED ON: 0/00/00 REVISED: 0/00/00



PHOENIX GOODYEAR SUPERFUND SITE
 GOODYEAR ARIZONA

ICF TECHNOLOGY INC.
 PITTSBURGH, PA

CROSS SECTION G-G'

DATE: 6/14/91

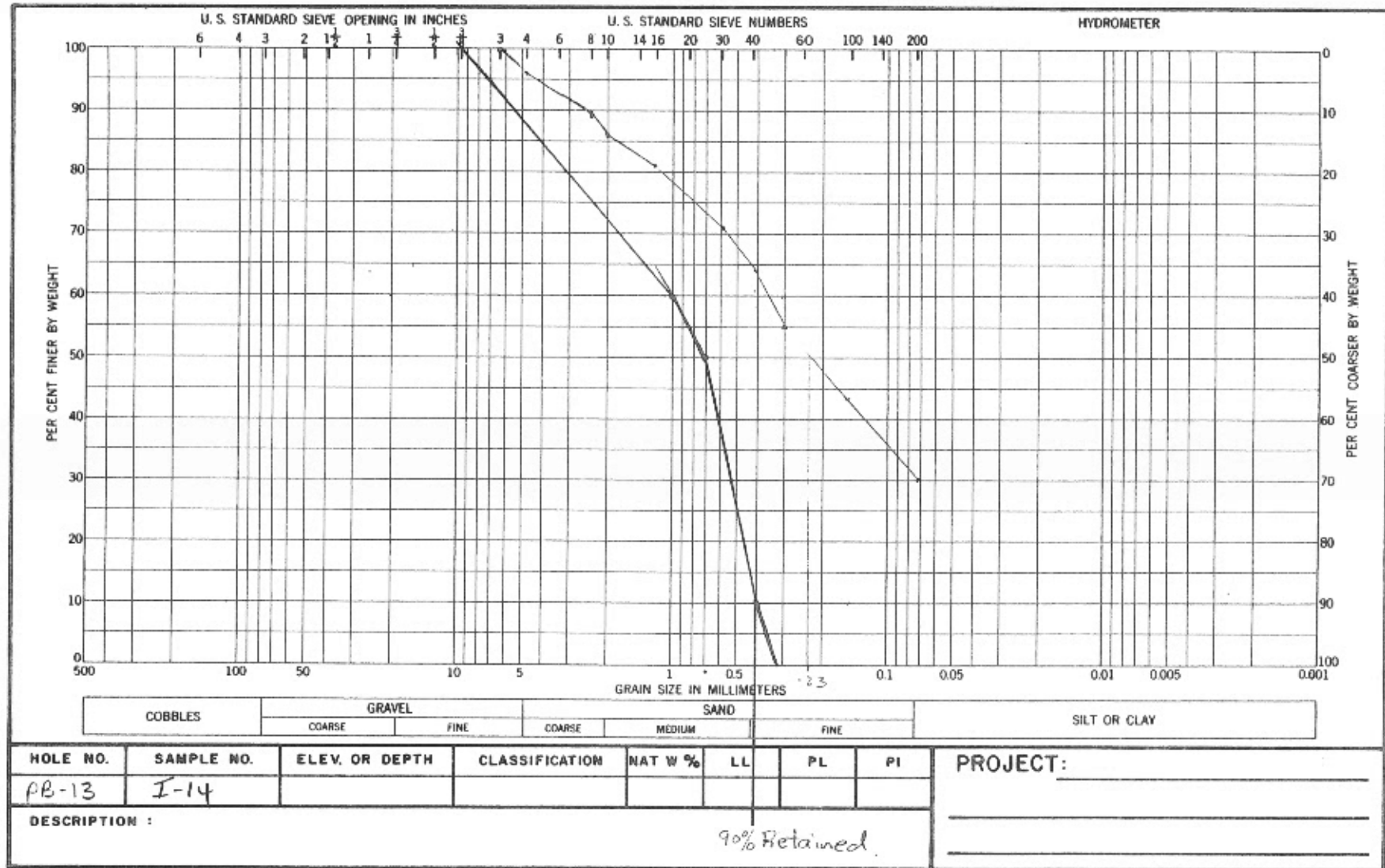
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SCALE: H 1"=400' V 1"=20'

DWG. NO.

APPENDIX B
Grain Size Analysis

GRAIN SIZE DISTRIBUTION ANALYSIS

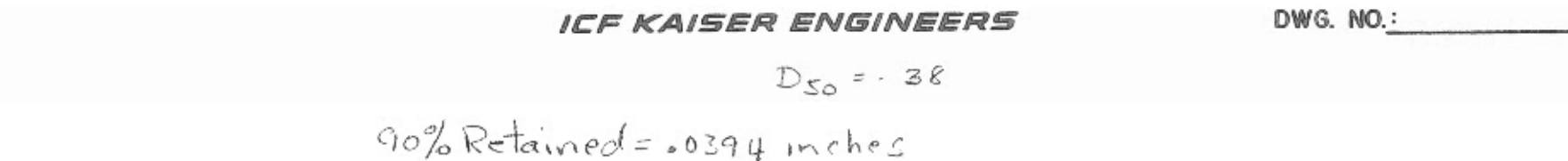


ICF KAISER ENGINEERS

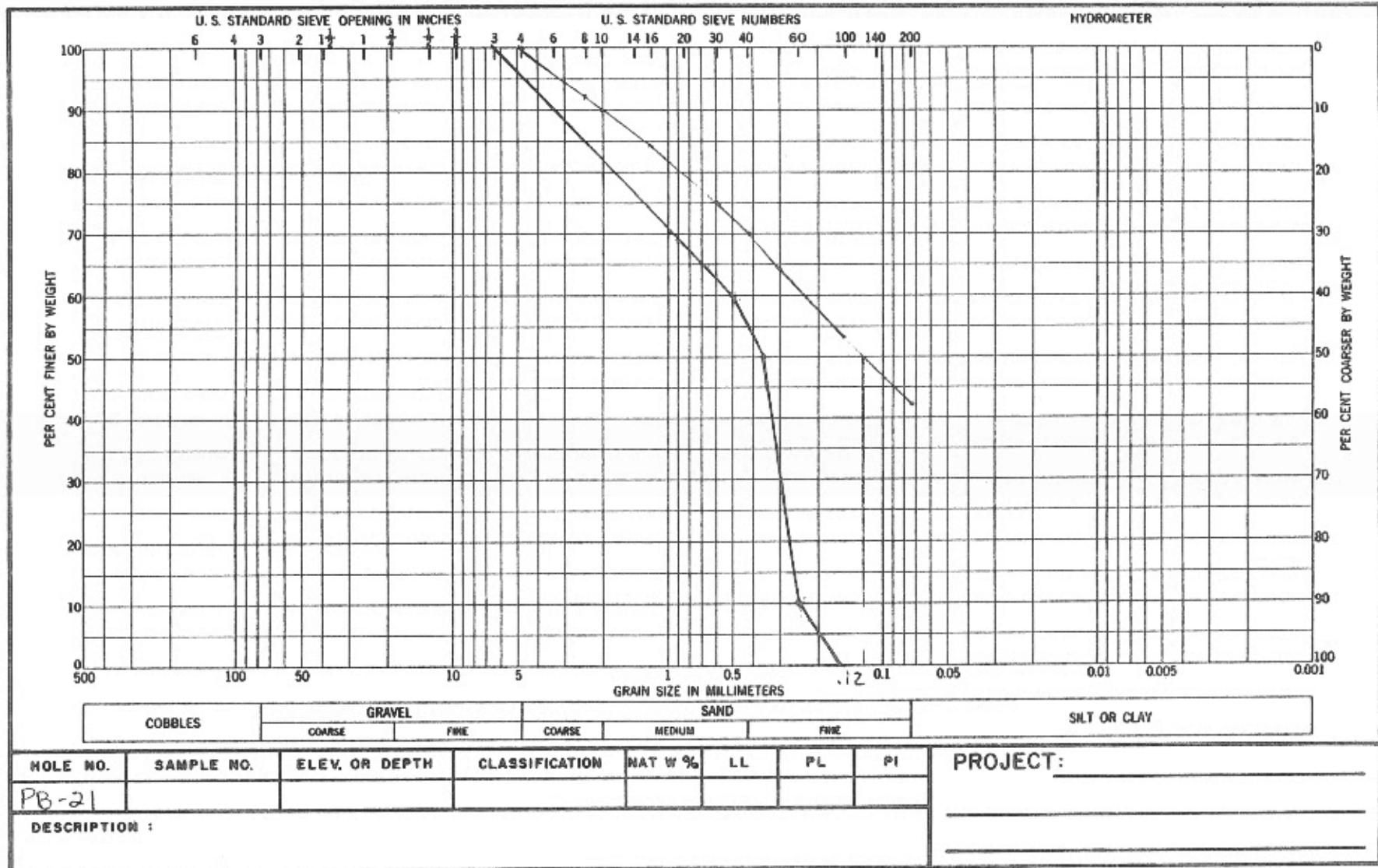
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D₅₀ = 0.23

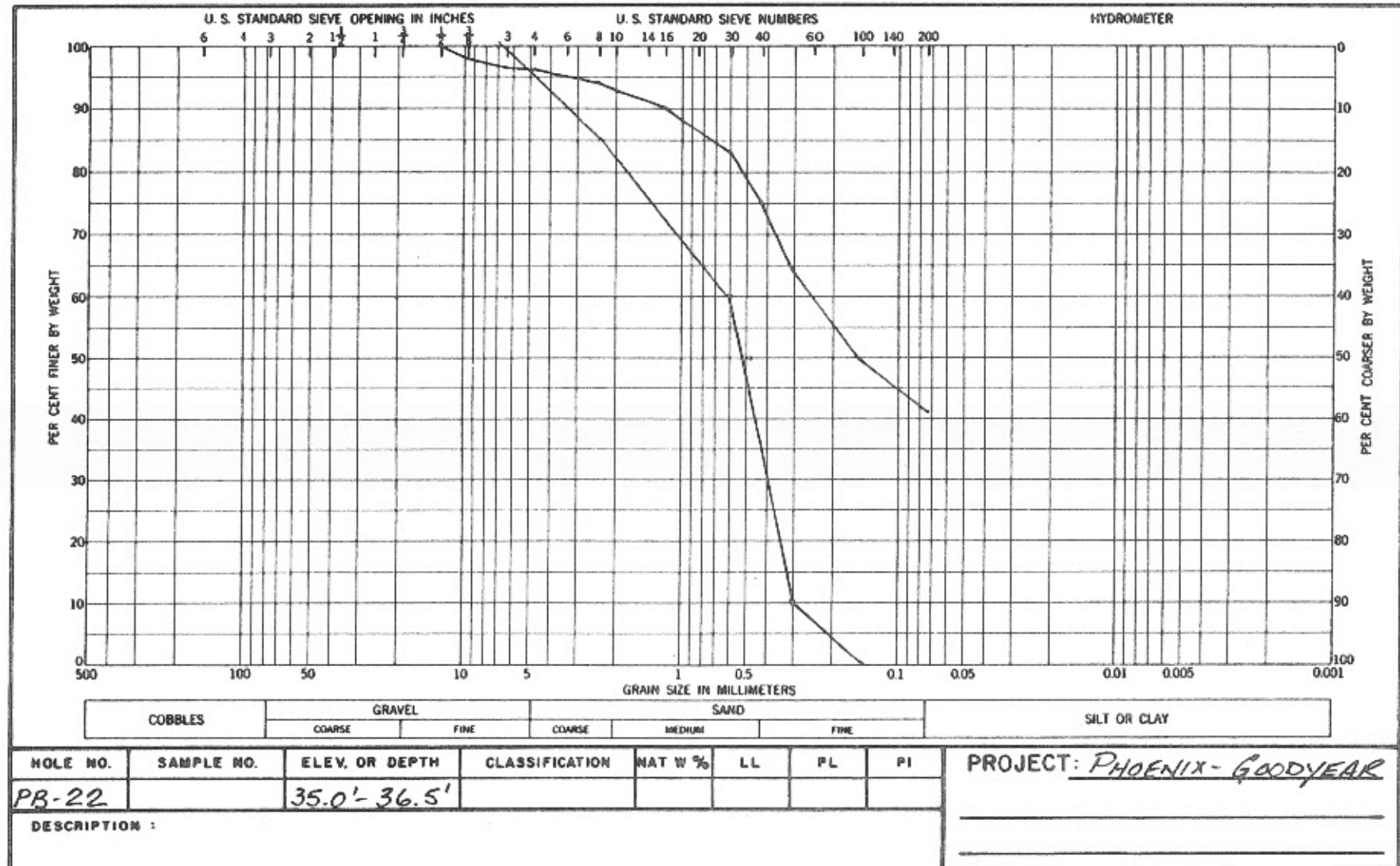
90% Retained = 0.0157 inches



GRAIN SIZE DISTRIBUTION ANALYSIS



GRAIN SIZE DISTRIBUTION ANALYSIS



ICF KAISER ENGINEERS

DWG. NO.:

$$D_{50} = 0.16 \text{ mm}$$

$$G_{200} = 100\%$$

GRAIN SIZE DISTRIBUTION ANALYSIS

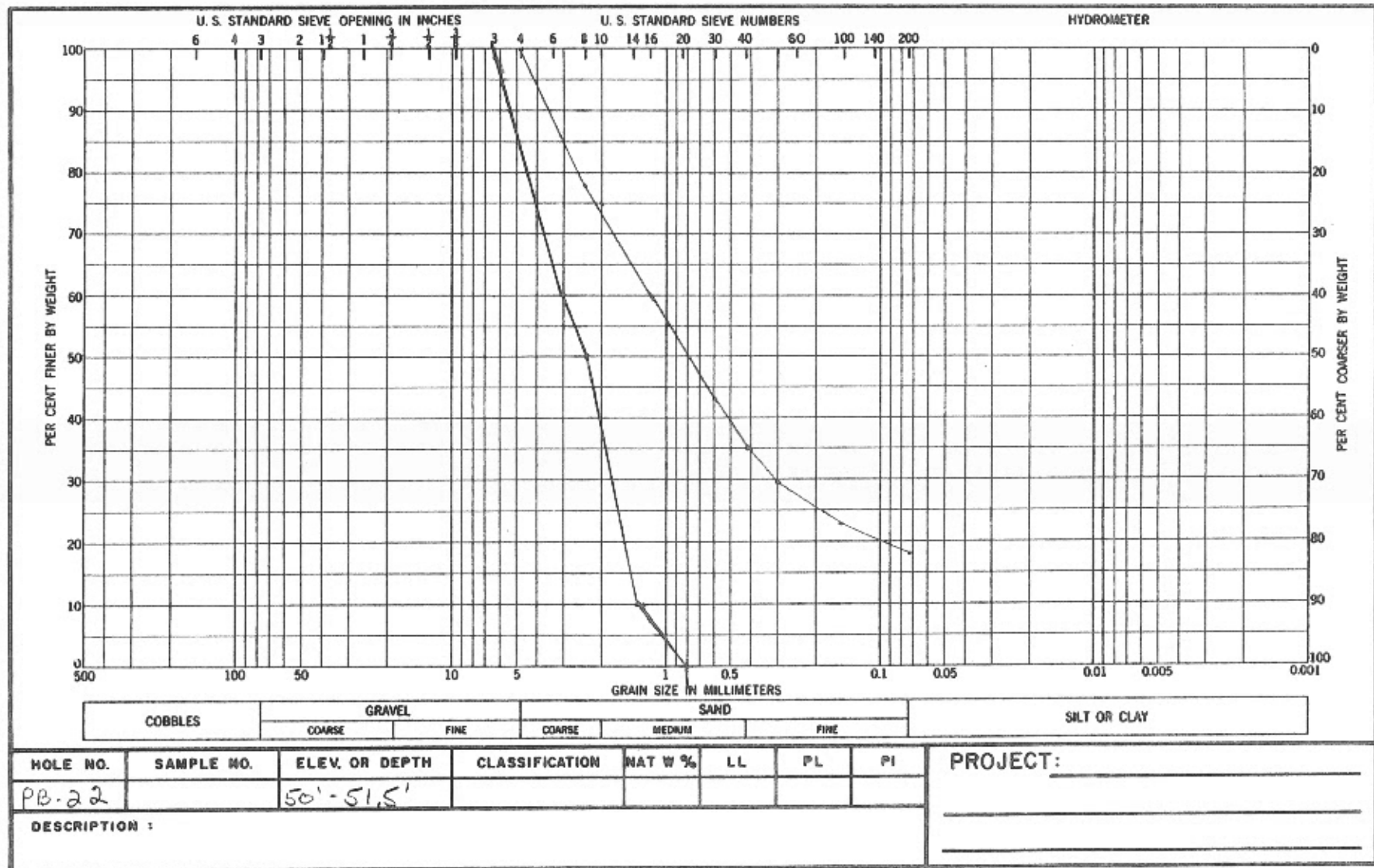


ICF KAISER ENGINEERS

DWG. NO.:

$D_{50} = 0.084 \text{ mm}$

90% Retained - 0.059 inches



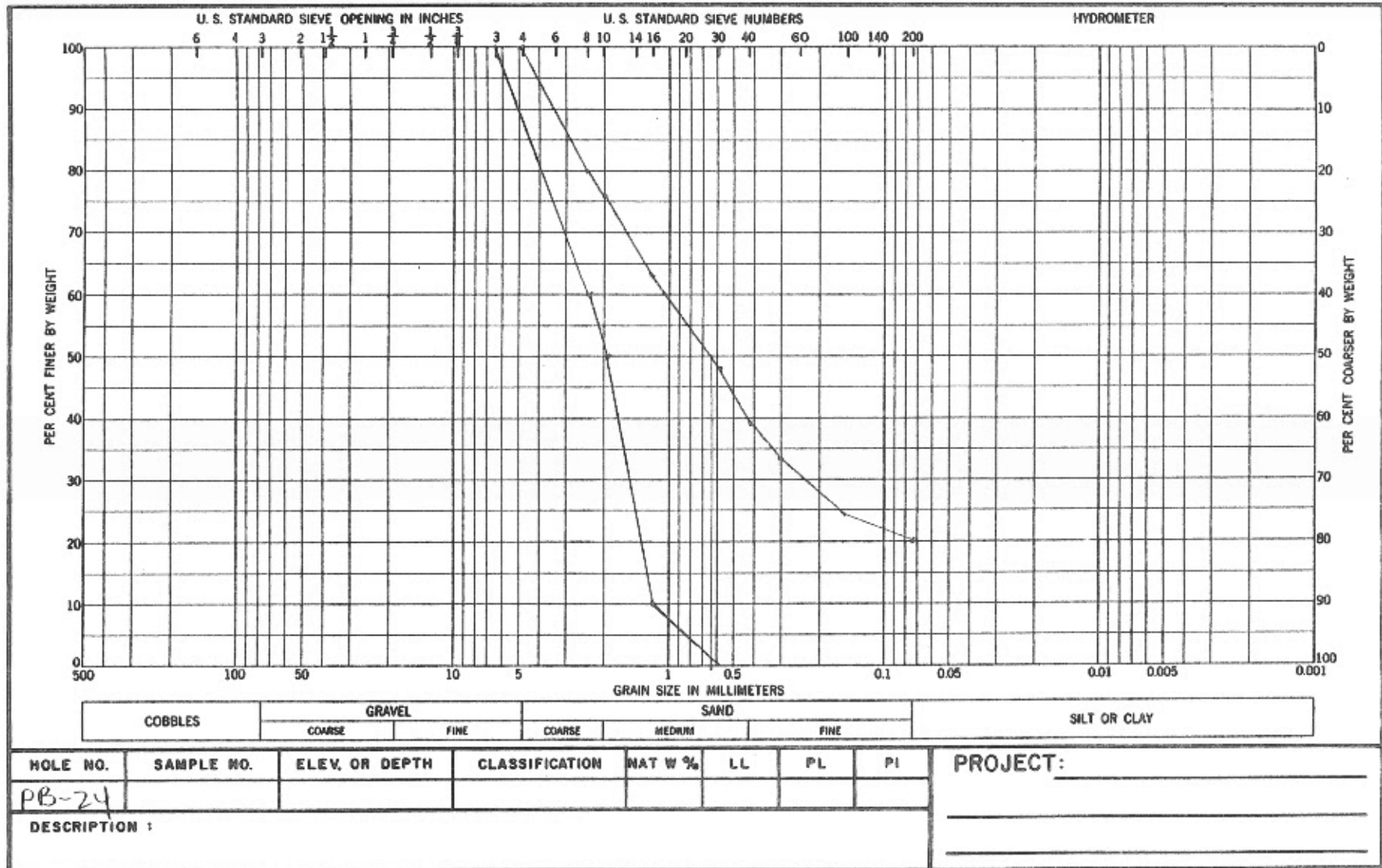
ICF KAISER ENGINEERS

DWG. NO.: _____

$$D_{50} = -8$$

90% Retained = .059

GRAIN SIZE DISTRIBUTION ANALYSIS



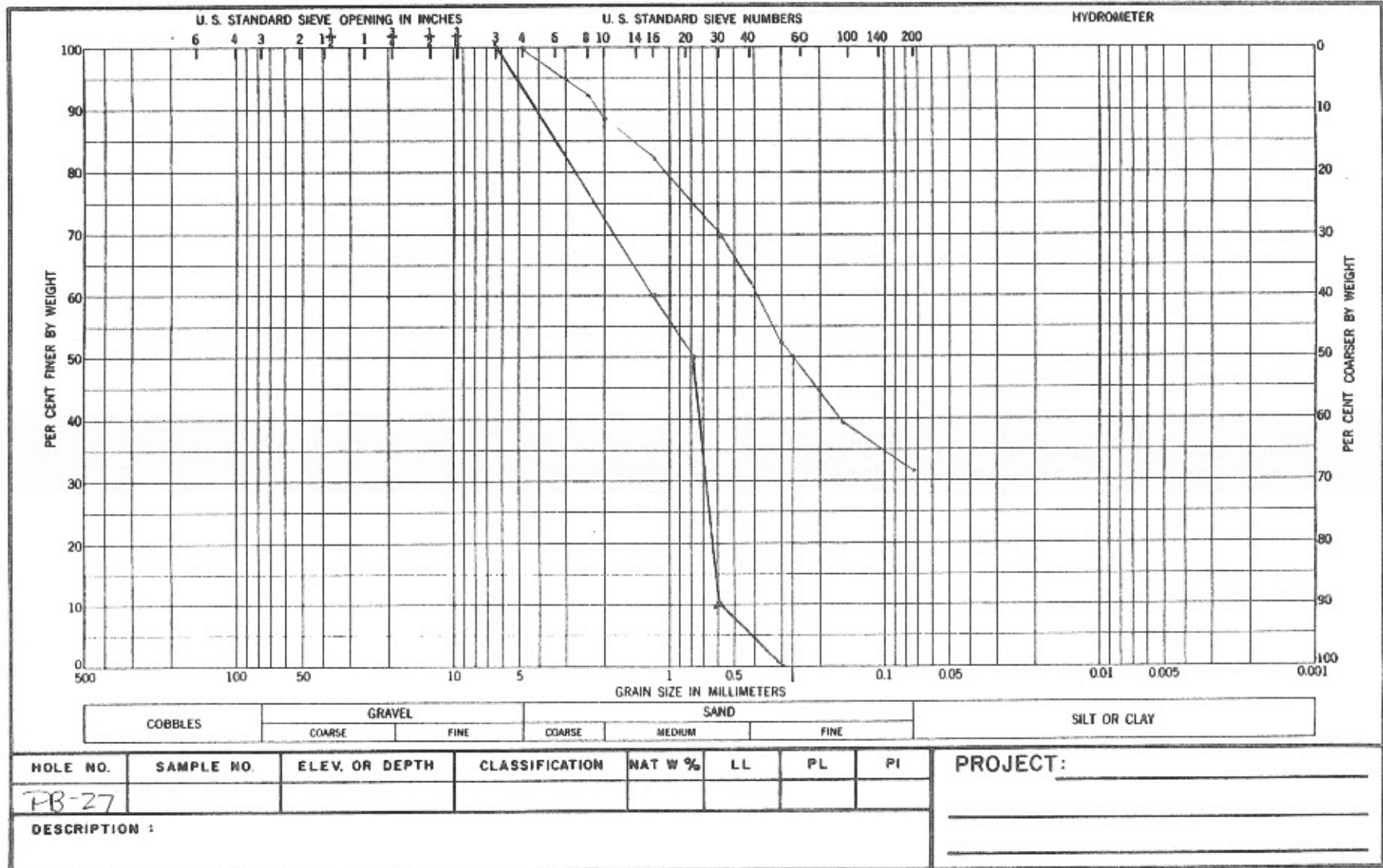
ICF KAISER ENGINEERS

DWG. NO.:

D₅₀ = .62

90% Retained = .0465 inches

GRAIN SIZE DISTRIBUTION ANALYSIS



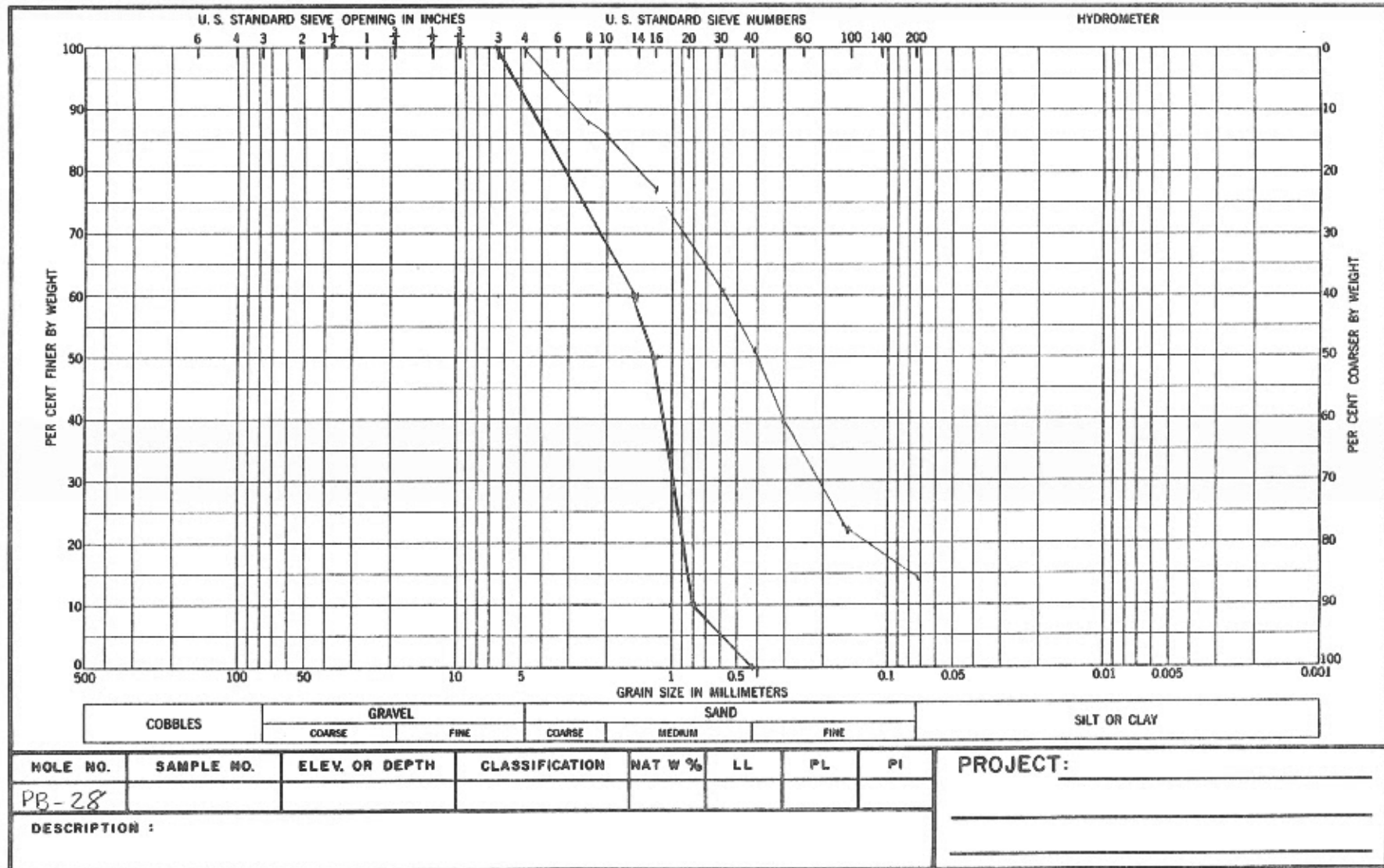
ICF KAISER ENGINEERS

DWG. NO.:

$D_{50} = 0.26$

and 1 - 100%

GRAIN SIZE DISTRIBUTION ANALYSIS



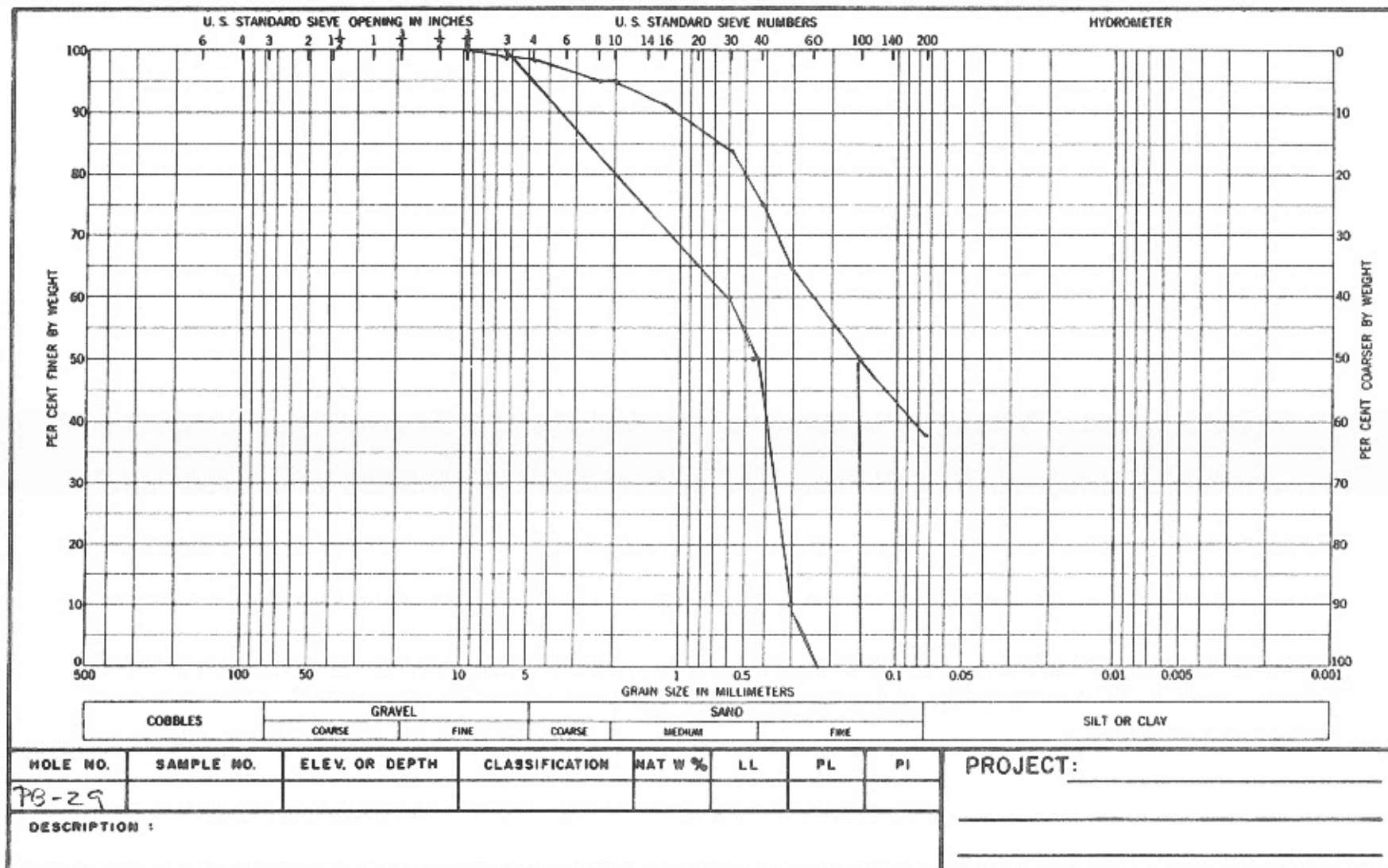
ICF KAISER ENGINEERS

DWG. NO.:

$D_{50} = 0.4$

90% RETAINED = 0.0276

GRAIN SIZE DISTRIBUTION ANALYSIS

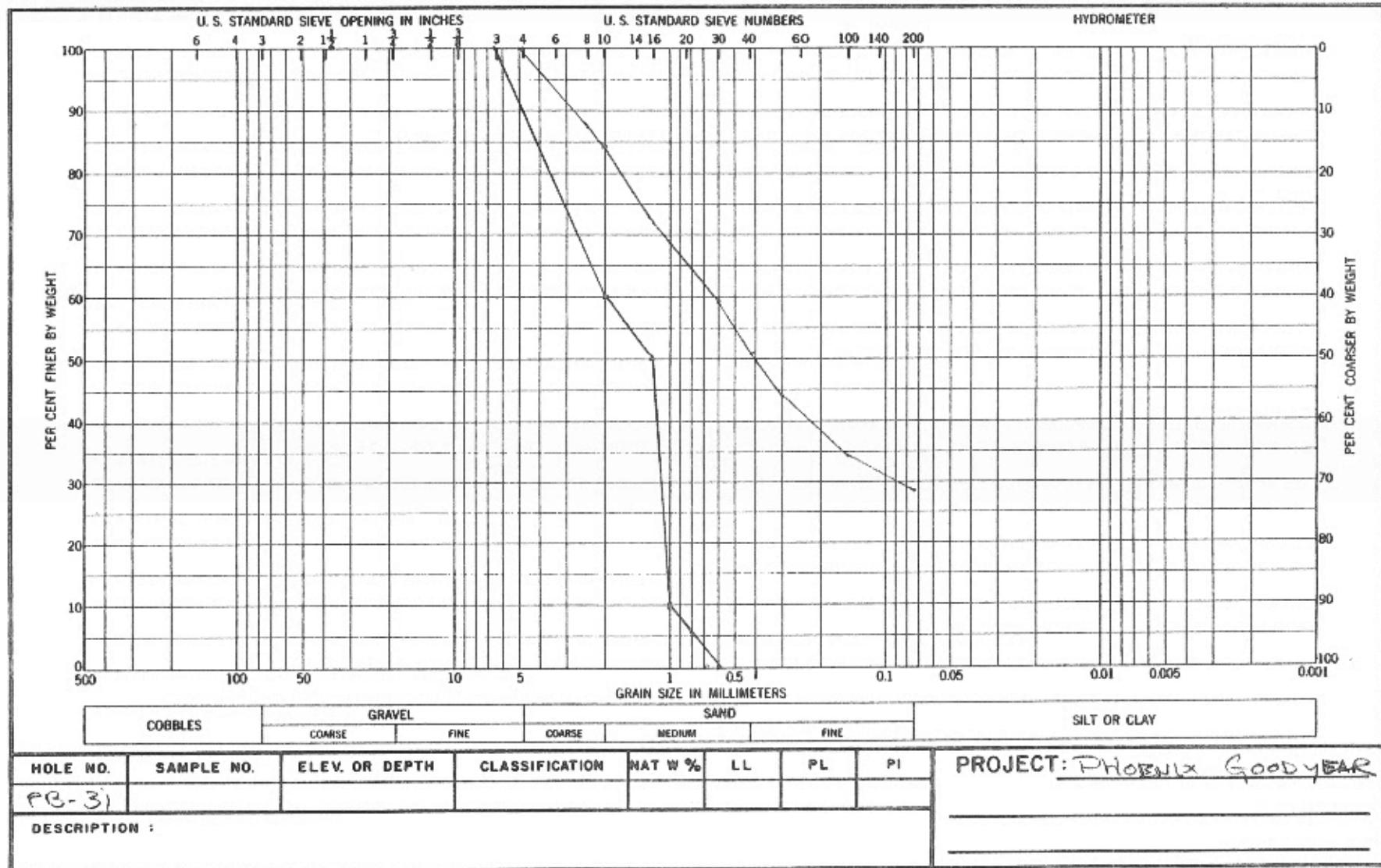


ICF KAISER ENGINEERS

DWG. NO.: _____

90% Retained = 0.0118

GRAIN SIZE DISTRIBUTION ANALYSIS



APPENDIX C
Soil Boring Logs

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-13/1-14</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>1</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>55.0'</u> <u>0700/5-10-91</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u>56.8'</u> <u>1000/5-10-91</u>		Start Date <u>5/09/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/10/91</u>
Total Boring Depth <u>106.5 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barnes</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
5					No samples collected from 0-20 ft. Mainly silts, sands, and gravels.			
10								
20	20.0-21.5	21-14-16	1.5	0 ppm			SM	
25	25.0-26.5	31-29-28	1.0	0 ppm		0545	SM	
30	30.0-31.5	34-29-28	1.5	0 ppm	GM - Silty sandy GRAVEL: br.; 40% gravel, ang. to subang., variable mineral composition; 30% sand, same as sample 20.0-25.0 ft.; 20% silt.	0600	GM	
35								

NOTES:

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-13/1-14</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>55.0'</u> <u>0700/5-10-91</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u>56.8'</u> <u>1000/5-10-91</u>		Start Date <u>5/09/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/10/91</u>
Total Boring Depth <u>106.5 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	15-29-12	1.0	0 ppm	SW - SAND with trace silt; red.-br.; 95% sand, fine to coarse grained, poorly to mod. well sorted, subang. to subrnd.; 5% silt.		SW	
40	40.0-41.5	18-24-34	1.0	0 ppm	SW - Gravelly SAND; red.-br.; 70% sand, as previous sample; 30% gravel, up to 1.25" ang. to subrnd.		SW	
45	45.0-46.5	28-34-44	1.0	0 ppm	GM - Silty sandy GRAVEL; red.-br.; 60% gravel, up to 1.25" in dia., ang. to subang.; 20% sand, as previous sample; 20% silt.		GM	
50	50.0-51.5	22-12-16	1.5	0 ppm	GW - Hit gravel zone up to 2" ni dia. spoon sample: clayey gravelly SAND: SW/SC - 40% sand, v. fine to fine grained, well sorted; 30% clay, br.; 20% gravels; 10% silt.		GW SW/ SC	
55	55.0-56.5	12-27-30	1.0	0 ppm	SW - Silty gravelly SAND; red.-br.; 85% sand, coarse grained, well sorted, subang. to subrnd. variable mineral composition: quartz, feldspars, ferromagnesium minerals; 10% gravel, variable mineral composition; 5% silt.		SW	
60	60.0-61.5	10-14-20	1.5	0 ppm	ML - SILT; red.-br.; firm, moist.		ML	
65	65.0-66.5	10-19-35	1.3	0 ppm	ML - Clayey sandy SILT; red.-br.; 40% silt; 30% sand, fine grained; 15% clay; 5% gravel.		ML	
70								

NOTES: HNu background = 0.0 ppm @ 0645 5/10/91.

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-13/1-14</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>3</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>55.0'</u> <u>0700/5-10-91</u>		Casing Elev. _____
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u>56.8'</u> <u>1000/5-10-91</u>		Start Date <u>5/09/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level _____		Finish Date <u>5/10/91</u>
Total Boring Depth <u>106.5 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barnes</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	70.0-71.5	10-19-25	1.5	0 ppm	CL - Upper 1.0 ft. sandy CLAY: red.-br.; 85% clay, stiff, plastic; 15% sand; v. fine gravel. SW - Lower 0.5 ft.: 90% sand; 5% gravel; 5% silt.		CL SW	
75	75.0-76.5	7-7-16	1.5	0 ppm	SW - SAND: red.-br.; 95% sand, coarse to fine grained, mod. well sorted, subang. to subrnd.; 5% silt.		SW	
80	80.0-81.5	10-10-25	1.5	0 ppm	SW - SAND: similar to above sample; 90% sand, med. to coarse grained, mod. well sorted, subang. to ang.; 5% gravel; 5% clay.		SW	
85	85.0-86.5	23-15-40	1.5	0 ppm	SW - As above sample (80.0-81.5).		SW	
90	90.0-91.5	14-19-20	1.5	0 ppm	SW - As above except greater percentage of gravel (10%); and clay (10%).		SW	
95	95.0-96.5	11-17-22	1.0	0 ppm	SW - As above, except gravels (5%); clay (5%)		SW	
100	100.0-101.5	14-19-22	1.5	0 ppm	SM - Silty SAND: reddish br.; 85% sand - description as previous sample; 15% silt.		SM	
105								

NOTES:

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-13/1-14</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>4</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>55.0'</u> <u>0700/5-10-91</u>		Casing Elev. _____	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>	After Drilling <u>56.8'</u> <u>1000/5-10-91</u>		Start Date <u>5/09/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level _____		Finish Date <u>5/10/91</u>	
Total Boring Depth <u>106.5 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>Borner</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	105.0- 106.5	10-12-16	1.5	0 ppm	SW - SAND: red.-br.; 95% sand as previous sample; 5% silt.		SW	
					Bottom of boring @ 106.5 ft.			
110								
115								
120								
125								
130								
135								
140								

NOTES:

ICF KAISER ENGINEERS

BORING LOG

Project name	Goodyear Tire & Rubber Co.	Project No.	03761-005-00	Boring No.	PB-14
Location	Goodyear, Arizona - PGA Site			Sheet	1 of 3
Drilling Firm	Heber Mining Co.	Water Levels:	Depth	Elevation	Time/Date
Drilling Method	Hollow Stem Auger	During Drilling	50.5	1251/5-16-91	G.S. Elev.
Hollow-Stem Auger O.D.	8" I.D.	3"	After Drilling		Casing Elev.
Rotary Bit Dia.	N/A	Casing Dia.	N/A	Well Level	Start Date 5/16/91
Total Boring Depth	89.0 ft.	Depth Measured Relative To	Grade		Finish Date 5/16/91
					Logged By J. Moore

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LTH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
5								
10	10.0-11.5	4-6-5	1.5	0 ppm	ML - Clayey sandy SILT; br., 90% silt, non-plastic to v. low plasticity; 5% clay; 5% sand, med. to fine grained sands, mod. to well sorted; dry.	< 1130	ML	
20	20.0-21.5	18-26-50/.4	1.0	0 ppm	SW/ML - Silty gravelly SAND; br.; 20% silt; 50% sand, coarse to mostly fine sands; 30% gravels, subang. to subrnd.; poorly sorted grading to sandy SILT; lt gray; 95% silt; non-plastic; 5% sand; med. to fine sands; dry	< 1142	SW/ ML	
25	25.0-26.5	32-24-21	1.5	0 ppm	ML/SW - Sandy SILT; red-br.; 95% silt, non-plastic, firm; 5% sand, med. to mostly fine sands; grading to gravelly SAND; yellowish-br.; 85% sand, coarse to fine mostly med. sands; 15% gravels, v. ang. to subang.; poorly sorted, streambed deposits; dry.	< 1152	ML/ SW	
30	30.0-31.5	22-32-28	1.5	0 ppm	SW/ML/SW - Gravelly SAND; br.; 95% sand, coarse to fine grained; 5% gravels, well rnd. to subrnd. (30-30.5) sandy SILT; dull br.; 95% silt, non-plastic; 5% sand, med. to fine grained, mod. sorted, firm, moist to dry (30.5-30.9) grading to gravelly SAND; lt. br.; 90% sand, coarse to fine grained, mica present, subang. to subrnd.; 10% gravels; med. to mostly fine subrnd. to subang., mod. sorted, moist.	< 1200	SW/ ML/ SW	
35								

NOTES:

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-14</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>3</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>50.0'</u> <u>1215/5-16-91</u>		Casing Elev. _____
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling _____		Start Date <u>5/16/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level _____		Finish Date <u>5/16/91</u>
Total Boring Depth <u>89.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	18-21-20	1.2	0 ppm	SW - Gravelly SANDS; dk. br. to br.; 85% sand coarse to fine, mostly med. sands; 25% gravels, rnd. to subang., med. to fine gravels, hard; dry to moist.	< 1209	SW	
40	40.0-41.5	19-50/6"	0.9	0 ppm	SW - Gravelly SANDS; br.; 75% sand, coarse to fine sands, mostly med.; 25% gravels, med. to mostly fine ang. to subrnd. gravels; hard, poorly sorted; dry to moist.	< 1215	SW	
45	45.0-46.5	23-50/6"	1.0	0 ppm	GM/GP - SILT and GRAVEL; dk. br.; 50% silt, non-plastic; 50% gravel, coarse to fine, ang. to subang. gravels; grading to sandy GRAVEL; br.; 10% sand, coarse to fine sands; 90% gravels, coarse to fine, v. ang. to subang. gravels, poorly sorted; dry	< 1232	GM/ GP	
50	50.0-51.5	50/6"	0.5	0 ppm	GP - Silty sandy GRAVELS; gray-br.; 10% silt, non-plastic; 10% sand, coarse to fine grained; 80% gravels, coarse to fine, subang. to v. ang. rock frag./gravels, mod. sorted streambed deposits; wet.	< 1251	GP * wet @ 50.5	
55	55.0-56.5	21-50/2"	0.5	0 ppm	GP - Same as above (50.0-51.5); except gravel content (85%); sand (10%); and silt (5%); wet.	< 1254	GP	
60	60.0-61.5	50-34-30	1.5	0 ppm	GP - Same as @ 50.0-51.5 (60.0-60.5) - ML - (60.5-61.5) Clayey sandy SILT; red-br.; 80% silt, non-plastic to v. low plasticity; 15% sand, med. to mostly fine sands; 5% clay, mod. sorted, moist to wet.	< 1306	GP/ ML	
65	65.0-66.5	24-33-136	0.9	0 ppm	SM/HL - Clayey silty SAND; br.; 45% silt, non-plastic; 50% sand, med. to mostly fine sands; 5% clay, mod. sorted; moist	< 1320	SM/ HL	
70								

NOTES: * Gravel zone (v. hard) observed @ approximately 38.0 ft.

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>FB-14</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>3</u> of <u>3</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>55.0'</u> <u>1215/5-16-91</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling <u> </u>		Start Date <u>5/16/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/16/91</u>
Total Boring Depth <u>89.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	70.0-71.5	12-14-18	0.7	0 ppm	SM - Gravelly silty SAND: br.; 25% silt, non-plastic; 60% sand, coarse to fine grained; 15% gravels, med. to fine, subrnd. to subang.; wet.	< 1330	SM/ SP	
75	75.0-76.5	14-19-20	0.3	0 ppm	SM/SP - Gravelly silty SAND: br.; 15% silt, non-plastic; 70% sand, coarse to fine sands, mostly med. grained; 15% gravels, med. to fine, rnd. to subrnd. gravels, poorly sorted; wet.	< 1338	SM/ SP	
80	80.0-81.5	8-11-12	0.4	0 ppm	SM/SP - Same as above (see 75.0-70.0) except 65% sand; 25% silt; 10% med. to fine gravels; wet.	< 1357	SM/ SP	
85	85.0-86.5	7-7-6	0.3	0 ppm	SW - Silty gravelly SAND: red-br.; 5% silt non-plastic; 75% sand, dominantly coarse to fine sands; 20% gravels, and. to subrnd., coarse to fine gravels; wet.	< 1409	SW	
	88.0-89.0	50/6"	0.2	0 ppm	SW - Silty gravelly SAND: br.; 5% silt; 60% sand, coarse to fine grained, mostly med. sands; 35% gravels, coarse to fine, ang. to subrnd. gravels; wet.	< 1428	SW	
90					Bottom of boring @ 89.0 ft.			
95								
100								
105								

NOTES: * Cobbles and boulders @ a depth of 88 ft. caused auger refusal.
ICF geologist requested sample from 88 to 89 ft. and borehole was terminated.

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-15</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>1</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>55.0'</u> <u>0615/5-13-91</u>		Casing Elev. _____	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>	After Drilling <u>51.0'</u> <u>1000/5-13-91</u>		Start Date <u>5/10/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level _____		Finish Date <u>5/13/91</u>	
Total Boring Depth <u>106.5 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
5					No samples collected from 0-10 ft. Cuttings predominantly sands, silts, and gravels.			
10	10.0-11.5	13-13-10	1.5	0 ppm	ML - SILT with few gravels: lt. red.-br.; 95% silt; 5% gravel.	1245	ML	
15	15.0-16.5	15-19-24	1.5	0 ppm	SM - Silty SAND: lt. red.-br.; 50% sand; 50% silt, stiff, brittle.	1300	SM	
20	20.0-21.5	9-10-12	1.5	0 ppm	ML - Sandy clayey SILT: grayish br.; 40% silt; 40% clay; 20% sand, v. fine grained.		ML	
25	25.0-26.5	9-14-12	1.0	0 ppm	ML - Clayey SILT: As sample 20.0-25.0 ft. in upper 0.25' of sample, (Lower 0.6 ft. of sample.) SW - SAND: v. fine to fine grained, few gravels (<5%)		ML SW	
30	30.0-31.5	23-27-23	1.0	0 ppm	SW - Silty gravelly SAND: red.-br.; 80% sand, fine to coarse, ang. to subrnd.; 10% gravel; 10% silt.	1325	SW	
35								

NOTES:

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-15</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>55.0'</u> <u>0615/5-13-91</u>		Casing Elev. _____
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u>51.0'</u> <u>1000/5-13-91</u>		Start Date <u>5/10/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level _____		Finish Date <u>5/13/91</u>
Total Boring Depth <u>106.5 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	21-50/.4'	1.0	0 ppm	SW - Gravelly SAND: as sample 30.0-35.0 ft. except larger amount of gravel (40%) and only a trace of silt; gravels are ang. to subrnd. variable mineral composition	1340	SW	
40	40.0-41.5	23-44-21	1.0	0 ppm	GW - Clayey sandy GRAVEL: lt. red.-br.; 50% gravel - as previous sample; 40% sand - as previous sample; 10% clay.		GW	
45	45.0-46.5	36-50/.2'	1.0	1.0 ppm	GC - Sandy clayey GRAVEL: red.-br.; 50% gravel; 20% sand, fine to coarse grained, subang. to subrnd., poorly sorted; 20% clay; 10% silt.		GC	
50	50.0-51.5	28/50/.3'	1.0	0.4 ppm	GC/GW - Clayey sandy GRAVEL: 40% gravel; 40% sand; 20% clay; sample is similar to 45.0-50.0 ft.		GC/ GW	
55	55.0-56.5	14-17-28	1.2	0.4 ppm	ML - Sandy clayey SILT: red.-br.; 80% silt; 10% clay; 10% sand, fine grained	0615	ML	
60	60.0-61.5	6-9-14	1.5	0.4 ppm	Sample same as 55.0-60.0 ft.		ML	
65	65.0-66.5	11-15-18	1.5	0.2 ppm	GC - Upper 0.4' clayey GRAVEL: CL - Middle 0.6' silty CLAY: SW - Lower 0.5' SAND: poorly sorted, fine to coarse grained, subang. to subrnd.		GC CL SW	
70								

NOTES: HNu background = 0.2 ppm

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-15</u>	
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>3</u> of <u>4</u>	
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____	
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>55.0'</u> <u>0615/5-13-91</u>		Casing Elev. _____	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u>51.0'</u> <u>1000/5-13-91</u>		Start Date <u>5/10/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level _____		Finish Date <u>5/13/91</u>	
Total Boring Depth <u>106.5 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	70.0-71.5	14-18-17	1.5	0.2 ppm	GM - Upper 0.5' clayey sandy GRAVEL; SC - Middle 0.5' silty clayey SAND; GC - Lower 0.5' silty gravelly SAND		GM SC GC	
75	75.0-76.5	8-15-20	1.0	0.2 ppm	SC - Gravelly clayey SAND: red.-br.; 50% sand, subang. to subrnd., fine to coarse grained, poorly sorted; 30% clay; 10% silt; 10% gravel		SC	
80	80.0-81.5		1.5	0.2 ppm	SW - SAND with minor amounts of silt, clay and gravel: red.-br.; 85% sand, coarse grained with fine-med. mixed, mod. well sorted, subang. to subrnd.; 5% gravel; 5% silt; 5% clay		SW	
85	85.0-86.5	9-12-12	1.5	0.2 ppm	SW - As above sample (80.0-85.0) slightly more silty		SW	
90	90.0-91.5	6-8-12	1.5	0.2 ppm	SW - Upper 0.5 ft. as above sample GC - Middle 0.5 ft. clayey GRAVEL CL - Lower 0.5 ft. silty CLAY		SW GC CL	
95	95.0-96.5	7-8-10	1.0	0.2 ppm	ML - Sandy clayey SILT: red.-br.; 90% silt; 5% clay; 5% sand, fine grained		ML	
100	100.0-101.5	7-9-9	0.7	0.2 ppm	SM - Silty SAND: red.-br.; 50% sand; 50% silt		SM	
105								

NOTES: HNu annulus reading @ 0635 - 0.6 ppm.
HNU background = 0.2 ppm

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-15</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>4</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>55.0'</u> <u>0615/5-13-91</u>		Casing Elev. <u> </u>	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>	After Drilling <u>51.0'</u> <u>1000/5-13-91</u>		Start Date <u>5/10/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u> </u>		Finish Date <u>5/13/91</u>	
Total Boring Depth <u>106.5 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	105.0- 106.5	50/.3'	0.7	0.2 ppm	SM - As previous sample.		SM	
					Bottom of boring @ 106.5 ft.			
110								
115								
120								
125								
130								
135								
140								

NOTES:

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>	Project No. <u>03761-005-00</u>	Boring No. <u>PB-16</u>
Location <u>Goodyear, Arizona - PGA Site</u>		Sheet <u>1</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>	G.S. Elev. _____
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>45.0'</u> <u>0915/5-21-91</u>	Casing Elev. _____
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>	After Drilling _____	Start Date <u>5/21/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level _____	Finish Date <u>5/21/91</u>
Total Boring Depth <u>107.0 ft.</u>	Depth Measured Relative To _____	Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PIU or OVA(1)				
5								
10	10.0-11.5	7-9-10	0.9	0.4 ppm	ML/SM - Sandy SILT: dull br.; 65% silt, brittle, non-plastic, bedding plains visible; 35% sand, med. to mostly fine grained, mod. sorted; dry	< 0750	ML/ SM	
15								
20	20.0-21.5	13-14-15	0.7	0.2 ppm	SW - SAND: br.-gray; 100% sand, coarse to fine grained, mostly med. sands, well graded, well sorted, subrnd. to rnd. grains; dry	< 0807	SW	
25	25.0-26.5	22-50/4"	0.6	0.2 ppm	GM - Silty GRAVEL: br.-gray; 15% silt, non-plastic, slightly brittle; 10% sand, coarse to fine grained; 75% gravel, coarse to fine gravels, mostly fine, subang. to subrnd., poorly sorted; dry	< 0816	GM	
30	30.0-31.5	50/ 4"	0.2	0.0 ppm	SAME as 25.0-26.5 ft. with 80% GRAVELS: 15% silt; 5% sand; dry to moist	< 0830	GM	
35								

NOTES:

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-16</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>45.0'</u> <u>0915/5-21-91</u>		Casing Elev. _____
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling _____		Start Date <u>5/21/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level _____		Finish Date <u>5/21/91</u>
Total Boring Depth <u>107.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	28-50/5"	0.7	0.0 ppm	GM - Silty GRAVELS: grayish-br.; 10% silt; non-plastic to v. low plasticity; 5% sand, coarse to fine grained; 85% gravels, coarse to fine, mostly fine gravels, v. ang. to subrnd., poorly sorted; dry to moist.	< 0840	GM	
40	40.0-41.5	14-50/3"	0.3	0.2 ppm	GM - Silty GRAVELS: br.; 10% silt, non-plastic to v. low plastic; 90% gravels, coarse to fine, mostly fine subang. to subrnd., poorly sorted; moist.	< 0855	GM	
45	45.0-46.5	28-50/2"	0.3	0.4 ppm	SAME as 40.0-41.5; wet @ 45.0 ft	< 0915	GM	
50	50.0-51.5	8-16-12	0.9	0.0 ppm	GW/ML - Sandy GRAVELS: grayish-br.; 20% sand, coarse to fine, rnd. to subrnd., poorly sorted; moist.	< 0925	GW/ ML	
55	55.0-56.6	11-16-14	0.8	0.0 ppm	SW - Gravelly, silty SAND: red.-br.; 5% silt, non-plastic; 90% sand, coarse to fine, mostly med. sands; 5% gravel, med. to mostly fine, subang. to subrnd. gravels, mod. sorted; wet	< 0944	SW	
60	60.0-61.5	18-50/3"	0.5	0.0 ppm	SW - Silty gravelly SAND: lt. br.; 5% silt, non-plastic; 75% sand, coarse to fine grained, mostly medium; 20% gravels, medium to mostly fine, subang. to subrnd. gravels, poorly sorted, poorly cemented, moist to wet	< 0952	SW	
65	65.0-66.5	15-17-18	0.9	0.0 ppm	ML - Sandy, clayey SILT; red brown; 90% silt, non-plastic to v. low plasticity; 5% clay; 5% sand, fine grained mica flakes present, moderately sorted, wet to moist	< 1002	ML	

NOTES:

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-16</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>3</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>45.0'</u> <u>0915/5-21-91</u>		Casing Elev. _____	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>	After Drilling _____		Start Date <u>5/21/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level _____		Finish Date <u>5/21/91</u>	
Total Boring Depth <u>107.0 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	70.0-71.5	11-13-12	1.1	0.0 ppm	ML - Sandy clayey SILT: red-br.; 85% silt, non-plastic to v. low plasticity with trace black organic matter; 10% clay; 5% sand, med. to mostly fine grained, mod. sorted moist	< 1017	ML	
75	75.0-76.5	22-50/6"	0.6	0.0 ppm	SW - Silty gravelly SAND: red-br.; 5% silt, non-plastic; 75% sand, coarse to fine grained, mostly med. sands; 20% gravels, med. to mostly fine, ang. to subrnd.; moist to wet	< 1028	SW	
80	80.0-81.5	10-12-16	0.3	0.0 ppm	SAME as 75.0-76.5; 80% sand; 15% gravel; 5% silt; moist to wet.	< 1037	SW	
85	85.0-86.5	50/1"	NR	NA	No Recovery	< 1050		
90	90.0-95.0	50/3"	0.2	0.0 ppm	GM/GW - Silty sandy GRAVEL: br.; 10% silt, non-plastic; 10% sand, coarse to fine, mostly med. grained; 80% gravel, coarse to fine mostly fine, subang. to subrnd., poorly sorted, hard; wet	<1130	GW/ GM	
95	95.0-96.5	50/3"	NR	NA	No Recovery	< 1200		
100	100.0-101.5	20-50/4"	0.7	0.0 ppm	SM - Silty SAND: grayish br.; 10% silt, non-plastic; 90% sand, coarse to fine grained, mostly med. sands; bedding visible, mod. sorted; wet	< 1210	SM	

NOTES:

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>	Boring No. <u>PB-16</u>
Location <u>Goodyear, Arizona - PGA Site</u>			Sheet <u>4</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>	G.S. Elev. <u> </u>	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>45.0'</u> <u> </u> <u>0915/5-21-91</u>	Casing Elev. <u> </u>	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>	After Drilling <u> </u> <u> </u> <u> </u>	Start Date <u>5/21/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u> </u> <u> </u> <u> </u>	Finish Date <u>5/21/91</u>	
Total Boring Depth <u>107.0 ft.</u>	Depth Measured Relative To <u> </u>	Logged By <u>J. Moore</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	105.0- 106.5	18-50/3	0.5	0.0 ppm	ML - Clayey sandy SILT: grayish-br.; 90% silt, non-plastic; 10% sand, coarse to fine, mostly med. grained, mica flakes visible, mod. sorted; moist to wet. SM - Silty SAND: grayish-br.; 10% silt, non- plastic, 90% sand, coarse to fine, mostly med. grained, poorly sorted, v. dense, hard; moist to wet.	< 1240	ML/ SM	
110					Bottom of boring @ 107.0 ft.			

NOTES:

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>	Project No. <u>03761-005-00</u>	Boring No. <u>PB-17/</u> <u>E-15</u>
Location <u>Goodyear, Arizona - PGA Site</u>		Sheet <u>2</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>	G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>51.0'</u> <u>0700/5-10-91</u>	Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>	After Drilling <u> </u>	Start Date <u>5/09/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u> </u>	Finish Date <u>5/10/91</u>
Total Boring Depth <u>107.0 ft.</u>	Depth Measured Relative To <u>Grade</u>	Logged By <u>Borner</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
40	40.0-41.5	60/0.5'	0.25	0.6 ppm	ML - Sandy gravelly SILT: lt. br. matrix; 60% silt; 30% gravel, fine to coarse ang. to subrnd.; 10% sand, fine to coarse grained, subang. to subrnd.		ML	
45	45.0-46.5	25-50/0.5'	1.0	1.0 ppm	SC/GC - Clayey gravelly SAND: lt. br.; 50% sand, med. to coarse grained, subang. to subrnd., mod. well sorted, mineral constituents are quartz, feldspars and ferromagnesium minerals; 30% gravel, ang. to subrnd., same mineral composition as sands; 20% clay; moist.		SC/ GC	
50	50.0-51.5	40-35-26	1.0	1.0 ppm	SC/GC - As above, except 20% gravel; 15% clay and 5% silt; moist to wet.		SC/ GC	
55	55.0-56.5	12-10-4	0.5	0.0 ppm	SW - Gravelly SAND: lt. br. to red.-br.; 70% sand, med. to coarse, subang. to subrnd., mod. well to well sorted; 30% gravel, variable colors, variable mineral composition, 0.25 to 0.5 inch diameter.		SW	
60	60.0-61.5	21-14-10	1.5	0.0 ppm	SW - Upper 1.0 ft. sandy GRAVEL: lt. br. to red.-br.; 50% gravel; 50% sand; same characteristics as in 55.0-60.0'. CL - Lower 0.5 ft. silty CLAYS: br. to red.-br.; 50% silt; 50% sand, low to med. plasticity.		SW CL	
65	65.0-66.5	10-14-30	1.0	0.0 ppm	SC - Gravelly, silty, clayey, SAND: red.-br.; 60% sand, med. to coarse grained, subang. to subrnd., mineral constituents are quartz, feldspars and ferromagnesium minerals, mod. well to well sorted; 30% clay; 10% silt; and 10% gravel, up to 1 inch in diameter, ang. to subangular.		SC	
70								

NOTES:

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-17/</u> <u>E-15</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>3</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>51.0'</u> <u>0700/5-10-91</u>		Casing Elev. <u> </u>	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>	After Drilling <u> </u>		Start Date <u>5/09/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u> </u>		Finish Date <u>5/10/91</u>	
Total Boring Depth <u>107.0 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>Barnes</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	70.0-71.5	8-21-30	1.0	0.0 ppm	SM - Clayey silty SAND: lt. red.-br.; 70% sand, fine grained, well sorted, subang. to subrnd.; 20% silt; 10% clay.		SM	
75	75.0-76.5	15-25-18	1.5	0.0 ppm	SW - Clayey, silty, gravelly SAND: red.-br.; 60% sand, fine to coarse grained, mod. well sorted; 20% gravel, ang. to subrnd.; 10% silt; 10% clay.		SW	
80	80.0-81.5	12-18-22	1.0	0.0 ppm	SM - Clayey, gravelly, silty SAND: lt. br. to red.-br.; 50% sand, fine to coarse grained, subang. to subrnd.; 30% silt; 10% gravels, ang. to subrnd. up to 0.75 inches in diameter; 10% clay.		SM	
85	85.0-86.5	27-55/.5'	0.7	0.0 ppm	CL/GC - Gravelly silty clays: red.-br.; 50% clay; 30% silt; 20% gravel up to 0.5 inches in diameter, ang. to subrnd. Bottom 2 inches is a lt. br. caliche layer.		CL/ GC	
90	90.0-91.5	10-22-43	1.0	0.0 ppm	CL/GC - As above (see 85.0-90.0).		CL/ GC	
95	95.0-96.5		1.0		CL - Sandy, silty, CLAY: brick red to red.-br.; 40% silt; 10% very fine sand, firm and moist.		CL	
100	100.0-101.5	10-19-19	1.5	0.0 ppm	SP - Upper 0.8 ft. sand: red.-br.; 100% sand, coarse grained, well sorted, subang. to subrnd. CL - Bottom 0.7 ft. silty clay: lt. red.-br.; 60% clay; 40% silt; plastic.		SP CL	
105								

NOTES:

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-17/ E-15</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>4</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>51.0'</u> <u>0700/5-11-91</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u> </u>		Start Date <u>5/09/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/13/91</u>
Total Boring Depth <u>107.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	105.0- 105.6	9-22-19	1.5		Sample as above (see 100.0-105.0).			
					Bottom of boring @ 107.0'.			
110								
115								
120								
125								
130								
135								
140								

NOTES:

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-18</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>1</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>45.5'</u> <u>0736/5-17-91</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling <u> </u>		Start Date <u>5/17/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/17/91</u>
Total Boring Depth <u>107.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
5								
10	10.0-11.5	9-12-17	1.5	0.2 ppm	ML - Sandy gravelly SILT: dull red.-br.; 85% silt, soft to firm, brittle, non-plastic; 5% sand, coarse to fine grained; 10% gravel, med. to mostly fine, rounded to subrnd.; mod. sorted, dry.	< 0630	ML	
15								
20	20.0-21.5	12-22-28	0.7	0.0 ppm	SM/SW - Gravelly silty SAND: lt. br.; 15% silt, firm, brittle, non-plastic; 80% sand, med. to mostly fine grained, with trace amt. of coarse; 5% gravel, subrnd., to rnd., med. to fine gravels, dry.	< 0639	SM/ SW	
25	25.0-26.5	14-50/3"	0.8	0.0 ppm	ML/GW - Sandy SILT: red.-br.; 90% silt, brittle, firm, non-plastic; 10% sand, med. to mostly fine sands, mod. sorted, dry. Sandy GRAVELS: gray; 30% sand, coarse to fine grained; 70% gravel, ang. to subang., mod. sorted, dry (coarse to fine gravels).	< 0704	ML/ GW	
30	30.0-31.5	22-18-20	0.6	0.0 ppm	SW - Gravelly SAND: grayish-white; 75% sand, coarse to fine grained sands, mostly med.; 25% gravels, subang. to subrnd., coarse to fine gravels, like streambed deposits, poorly sorted, dry.	< 0714	SW	
35								

NOTES: 20.0' - 21.5': Very thin bedding plains visible.

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-18</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>45.5'</u> <u>0736/5-17-91</u>		Casing Elev. _____
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling _____		Start Date <u>5/17/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level _____		Finish Date <u>5/17/91</u>
Total Boring Depth <u>107.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	18-50/6"	0.9	0.0 ppm	GM - Sandy silty GRAVEL: br.; 25% silt, firm, non-plastic; 15% sand, coarse to fine grained, mostly med. sands; 60% gravels, coarse to fine grained subang. to subrnd. dry to moist.	< 0714	GM	
40	40.0-41.5	50/5"	0.3	0.0 ppm	GM - Same as above (see 35.0'-36.5'); with 15% silt; 10% sand; 75% gravels, v. ang. to subang., dry to moist.	< 0727	GM	
45	45.0-46.5	20-22-26	1.5	0.6 ppm	SW - Gravelly SANDS: grayish-white; 75% sands, coarse to fine grained, mostly coarse sands; 25% gravels, coarse to fine, ang. to subang., poorly sorted, wet.	< 0736	SW	
50	50.0-51.5	8-13-10	1.5	0.0 ppm	ML - Sandy clayey SILT: red.-br.; 90% silt, firm, non-plastic to v. low plasticity; 5% clay; 5% sand, med. to mostly fine sands, mod. to well sorting, moist.	< 0750	ML	
55	55.0-56.5	5-7-6	1.3	0.4 ppm	ML - Clayey sandy SILT: red.-br.; 85% silt, firm, non-plastic to low plasticity; 5% clay; 10% sand, med. to mostly fine grained sands with mica flakes, mod. sorted, moist.	< 0758	ML	
60	60.0-61.5	8-10-14	0.9	0.0 ppm	ML/SW - Sandy clayey SILT: red.-br.; 80% silt, firm, non-plastic to low plasticity; 5% clay; 15% sands, med. to fine grained; grading to: silty gravelly SAND: br.; 5% silt; 85% sand, coarse to fine grained, mostly med.; 10% gravels, with med. to fine subang. to subrnd., poorly sorted, wet.	< 0815	ML/ SW	
65	65.0-66.5	9-9-5	NR	NA	No recovery (NR) NA - Not Available	< 0830		
70								

NOTES: * Drilling was very hard/resistant between 38.0 to 43.0 ft.
 * * Water observed in soils @ 45.5 ft.

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-18</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>3</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>45.5'</u> <u>0736/5-17-91</u>		Casing Elev. _____
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling _____		Start Date <u>5/17/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level _____		Finish Date <u>5/17/91</u>
Total Boring Depth <u>107.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	70.0-71.5	5-7-9	0.5	0.0 ppm	SW - sand; br.; 100% sand, coarse to fine, dominantly med. sands, well sorted, subang. to rounded, wet.	< 0838	SW	
75	75.0-76.5	8-7-9	0.7	0.5 ppm	SW - same as above (see 70.0'-71.5'), wet.	< 0909	SW	
80	80.0-81.5	9-9-16	1.0	0.5 ppm	SW - Gravelly SAND; br.-gray; 85% sand, coarse to fine grained, mostly med. sands; 15% gravels, coarse to fine gravels, submd. to rnd., poorly sorted, wet.	< 0924	SW	
85	85.0-86.5	22-20-12	0.7	0.4 ppm	SW - Same as above; 90% sand; 10% gravel grading to: ML - Sandy clayey SILT; br.; 85% silt, non-plastic to low plasticity, hard; 10% clay; 5% sand, fine grained, mica flakes present, moist.	< 0939	SW/ ML	
90	90.0-91.5	14-22-25	0.9	0.0 ppm	ML - Same as above; 90% silt; 5% clay; 5% sand grading to: SM - Clayey silty SAND; br.; 20% silt, non-plastic to low plasticity, firm to hard; 5% clay; 75% sand, med. to mostly fine sands, moist.	< 0945	ML/ SM	
95	95.0-96.5	15-24-16	1.1	0.0 ppm	ML - Sandy clayey SILT; br.; 80% silt, non-plasticity to low plasticity, firm to hard; 15% clay; 5% sand, med. to fine grained sands, mica flakes present, moist.	< 0958	ML	
100	100.0-101.5	15-22-24	1.5	0.0 ppm	ML - Same as above; 90% silt; 5% clay; 5% sand, moist.	< 1015	ML	
105								

NOTES: * Running sands start to cause problems @ a depth of 70.0 ft.

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-18</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>4</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u></u>	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>45.5'</u> <u>0736/5-17-91</u>		Casing Elev. <u></u>	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>	After Drilling <u></u> <u></u>		Start Date <u>5/17/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u></u> <u></u>		Finish Date <u>5/17/91</u>	
Total Boring Depth <u>107.0 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	105.0- 106.5	10-13-21	0.9	0.0 ppm	SW - Silty SAND: grayish-br.; 5% silt, non-plastic; 95% sand, med. to fine grained sand, mostly med. grained, wet.	< 1031	SW	-
					Bottom of boring @ 107.0 ft.			-
110								-
115								-
120								-
125								-
130								-
135								-
140								-

NOTES:

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-19</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>1</u> of <u>2</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u></u>	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>Not Available</u>		Casing Elev. <u></u>	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>	After Drilling <u></u>		Start Date <u>5/20/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u></u>		Finish Date <u>5/21/91</u>	
Total Boring Depth <u>43.0 ft. / 47.0 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
5								
10	10.0-11.5	22-50/5"	0.8	0.0 ppm	ML - Sandy gravelly SILT: dull br.; 90% silt, non-plastic, brittle, hard; 5% sand, med. to mostly fine grained; 5% gravels, coarse to fine, subang. to subrnd. poorly sorted, dry.	< 1200	ML	
15								
20	20.0-21.5	8-10-16	0.9	0.0 ppm	SW - Gravelly SAND: grayish-br.; 95% sand, coarse to mostly fine grained; 5% gravels, med. to dominantly fine gravels, rounded. to subang., poorly sorted, dry.	< 1220	SW	
25	25.0-26.5	50/3"	0.1	0.0 ppm	SW - Same as above: with 80% sands, 20% gravels; dry.	< 1230	SW	
30	30.0-31.5	28-50/4"	0.3	0.0 ppm	SW - Gravelly SAND: br.; 85% sand, coarse to fine, mostly med. grained; 15% gravels, subang. to subrnd., coarse to mostly fine gravels, poorly sorted, dry.	< 1300	SW	
35								

NOTES: * Gravel zone from 23.0 ft. to 33.0 ft. below grade.

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PS-19</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>2</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u> </u> <u>Not Available</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling <u> </u>		Start Date <u>5/20/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/21/91</u>
Total Boring Depth <u>43.0 ft. / 47.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	50/5"	0.2	0.0 ppm	GW - Silty sandy GRAVELS, gray-white; 10% silt, non-plastic; 10% sand, coarse to fine, mostly fine sand; 80% gravels, coarse to mostly fine, subang. to subrnd., dry.	< 1335	GW	
40	40.0-41.5	31-50/3"	0.5	0.0 ppm	GM - Silty GRAVEL: red.-br.; 40% silt, non-plastic to low plasticity; 5% clay; 5% sand, coarse to fine grained; 50% gravels, coarse to fine ang. to subrnd., poorly sorted, moist.	< 1340	GM	
45	45.0-46.5	50/5"	0.2	0.6 ppm	GW - Silty sandy GRAVELS: red.-br.; 5% silt; 5% sand, coarse to fine grained, mostly med. sands; 90% gravels, coarse to fine gravels, mostly fine subang. to subrnd. dry to moist. Auger refusal @ 43.0 ft. and 47.0 ft.	5-21-91 < 0635	GW	
50								
55					** Drilling observed heavy concentrations of gravel between 23.0 ft. and 47.0 ft. Borehole was offset once when auger refusal was observed @ 43.0 ft. and then at 47.0 ft.			
60								
65								
70								

NOTES: No water sample collected because of auger refusal.

BORING LOG

Project name						Goodyear Tire & Rubber Co.		Project No.		03761-005-00		Boring No.	PB-20	
Location						Goodyear, Arizona - PGA Site						Sheet	1 of 3	
Drilling Firm						Heber Mining Co.						G.S. Elev.		
Drilling Method						Hollow Stem Auger						Casing Elev.		
Hollow-Stem Auger O.D.						8" I.D. 3"						Start Date	5/17/91	
Rotary Bit Dia.						N/A Casing Dia. N/A						Finish Date	5/20/91	
Total Boring Depth						102.0 ft.						Logged By	J. Moor	
Water Levels:						Depth		Elevation		Time/Date				
During Drilling						55.0				0710/5-20-91				
After Drilling														
Well Level														
Depth Measured Relative To						Grade								
SCALE IN FEET	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)	MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION						
5														
10	10.0-11.5	5-5-7	1.3	0.0 ppm	ML - Sandy SILT: br.; 95% silt, non-plastic, brittle, soft to firm; 5% sand, fine grained, well sorted, dry.	< 1310	ML							
15														
20	20.0-21.5	20-24-50	1.0	0.4 ppm	SW - Silty gravelly SAND: br.; 10% silt, non- plastic; 65% sand, coarse to fine grained, mostly fine sands; 25% gravels, med. to mostly fine, subrnd. to subang., poorly sorted, dry.	< 1320	SW							
25	25.0-26.5	20-50/4"	0.7	0.4 ppm	GM - Sandy silty GRAVELS: grayish-white; 30% silt, brittle, non-plastic; 20% sand, coarse to fine-grained, mostly med.; 50% gravels, coarse to fine, subang. to ang., poorly sorted, dry.	< 1330	GM							
30	30.0-31.5	52/5"	0.4	0.2 ppm	SW/GW - GRAVEL AND SAND: br.; 50% sand, coarse to fine, mostly fine grained; 50% gravel, coarse to mostly fine gravels, subang. to rounded, poorly sorted, dry to moist.	5/20/91 < 0604	GW/ SW							
35														

NOTES:

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BORING LOG

Project name Goodyear Tire & Rubber Co. Project No. 03761-005-00
 Location Goodyear, Arizona - PGA Site
 Drilling Firm Heber Mining Co. Water Levels: Depth Elevation Time/Date
 Drilling Method Hollow Stem Auger During Drilling 55.0 0710/5-20-91
 Hollow-Stem Auger O.D. 8" I.D. 3" After Drilling _____
 Rotary Bit Dia. N/A Casing Dia. N/A Well Level _____
 Total Boring Depth 102.0 ft. Depth Measured Relative To Grade

Boring No. PB-20
 Sheet 2 of 3
 G.S. Elev. _____
 Casing Elev. _____
 Start Date 5/17/91
 Finish Date 5/20/91
 Logged By J. Moore

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
-	35.0-38.5	26-50/5"	0.3	0.2 ppm	SW - Silty gravelly SAND: br.; 5% silt, non-plastic; 50% sand, coarse to fine mostly coarse grained; 45% gravels, coarse to fine gravels, ang. to subrnd., poorly sorted, moist to dry.	< 0619	SW	-
-40	40.0-41.5	14-18-21	1.3	0.4 ppm	GW - Silty sandy GRAVEL: red.-br.; 5% silt, 35% sand, coarse to fine grained, mostly fine; 60% gravels, coarse to fine, mostly fine subang. to subrnd., streambed deposits, poorly sorted, moist.	< 0630	GW	-
-45	45.0-46.5	21-28-32	1.1	0.6 ppm	SW - Gravelly SANDS: grayish-br.; 2% silt; 83% sand, coarse to fine grained, mostly med. sands; 15% gravels, med. to fine, rnd. to subrnd., poorly sorted, moist.	< 0645	SW	-
-50	50.0-51.5	10-9-7	1.4	0.0 ppm	ML - Sandy clayey SILT: red.-br.; 85% silt, soft to firm, non-plastic to v. low plasticity; 10% clay; 5% sand, fine grained with small thin lenses of pure silt, mod. to well sorted, moist.	< 0700	ML	-
-55	55.0-56.5	16-21-21	0.6	0.0 ppm	SW - Silty gravelly SAND: red.-br.; 5% silt, non-plastic; 90% sand, coarse to fine grained, mostly med. sands; 5% gravels, med. to fine, subang. to subrnd., poorly sorted, moist to wet.	< 0710	SW	-
-60	60.0-61.5	6-7-7	0.9	0.2 ppm	ML - Sandy clayey SILT: red.-br.; 85% silt, soft to firm, non-plastic to low plasticity; 5% sand, fine grained, micaceous; 10% clay, mod. to well sorted, some sections are dry and brittle, moist to wet.	< 0722	ML	-
-65	65.0-66.5	7-13-15	0.2	0.0 ppm	ML - Sandy SILT: lt. br.; 90% silt, non-plastic to v. low plasticity; 10% sand, med. to dominantly fine grained, mica flakes present, mod. sorted, moist.	< 0733	ML	-
-70								

NOTES: * Wet @ approximately 55.0 ft.

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-20</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>3</u> of <u>3</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>55.5'</u> <u>0710/5-20-91</u>		Casing Elev. <u> </u>	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>	After Drilling <u> </u>		Start Date <u>5/17/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u> </u>		Finish Date <u>5/20/91</u>	
Total Boring Depth <u>102.0 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	70.0-71.5	9-12-16	0.4	0.0 ppm	Same as above (see 65.0-70.0); moist.	< 0745	ML	
75	75.0-76.5	11-19-21	0.3	0.0 ppm	ML - Clayey sandy SILT: red-br.; 90% SILT, non-plastic to v. low plasticity; 5% clay; 5% sand, fine grained, mod. to well sorted; moist to wet.	< 0800	ML	
80	80.0-81.5	5-6-4	0.2	0.0 ppm	Same as above (see 75.0 - 80.0); moist to wet.	< 0810	ML	
85	85.0-86.5	8-9-50/1"	0.3	0.0 ppm	ML - Gravelly SILT: red-br.; 80% silt, non-plastic to low plasticity; 5% clay; 5% sand, coarse to fine grained; 10% gravel, ang. to submd., poorly sorted; moist.	< 0825	ML	
90	90.0-91.5	11-14-50/4"	0.3	0.0 ppm	ML - Sandy SILT: br.; 90% silt, non-plastic to v. low plasticity; 5% clay; 5% sand, fine grained, poorly graded, mod. sorted; moist to wet.	< 0839	ML	
95	95.0-96.5	12-14-50/4"	0.4	0.0 ppm	ML/SW - Sandy SILT: br.; 55% silt, firm to hard non-plastic to low plasticity; 45% sand, coarse to fine grained. Grading to: silty gravelly SAND: 5% silt; non-plastic; 75% sand, coarse to fine grained; 20% gravel, submd. to subang, coarse to fine, poorly sorted; wet.	< 0900	ML/ SW	
100	100.0-101.5	50/3"	0.2	0.0 ppm	SM - Silty SAND: br.; 5% silt, non-plastic; 95% sand, coarse to fine grained, mostly med. sands, mod. to well sorted; wet.	< 0913	SM	
105								

NOTES: * Some small horizontal bedding plains visible.

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-21</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>1</u> of <u>3</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>55.0</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u>56.0</u> <u>1600/5-13-91</u>		Start Date <u>5/13/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/13/91</u>
Total Boring Depth <u>95.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION	
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)					
					No samples collected from 0.0 ft. to 20.0 ft. Predominantly silts, sands, and gravels.				
5									
10									
15									
20	20.0-21.5	22-28-43	0.8	0.1 ppm	SW - Silty gravelly SAND; red.-br.; 80% sand, fine to coarse grained, poorly sorted to mod. well sorted, subang. to subrnd.; 10% silt; 10% gravel		SW		
25	25.0-26.5	24-43-42	1.0	0.1 ppm	SW - Same as above (see 20.0-25.0 ft.).		SW		
30	30.0-31.5	50/0.25'	0.25	0.1 ppm	SW - Same as above (see 20.0-25.0 ft.).		SW		
35									

NOTES:

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-21</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>3</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u></u>	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>55.0</u>		Casing Elev. <u></u>	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>	After Drilling <u>56.0</u> <u>1600/5-13-91</u>		Start Date <u>5/13/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u></u>		Finish Date <u>5/13/91</u>	
Total Boring Depth <u>95.0 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>Barnes</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	50/0.25'	0.25	0.1 ppm	SW - Silty gravelly SAND: red.-br.; 60% sand, similar to sample 20.0-25.0 ft.; 30% gravel; 10% silt.		SW	
40	40.0-41.5	29-25-18	0.7	0.1 ppm	SW - Same as above, except becoming coarser grained.		SW	
45	45.0-46.5	4-6-7	0.7	0.1 ppm	CL - CLAY: red.-br.; 100% clay; bottom 2 inches is lt. br. caliche.		CL	
50	50.0-51.5	8-12-21	1.5	0.1 ppm	ML - Sandy SILT: red.-br.; 85% silt; 10% sand, v.f. grained; 5% gravel.		ML	
55	55.0-56.5	8-7-7	1.0	0.2 ppm	ML - SILT: red.-br.; 90% silt; 5% clay; 5% gravel.		ML	
60	60.0-61.5	12-18-19	1.5	0.2 ppm	CL - Gravelly silty CLAY: red.-br. to br.; 80% clay; 10% silt; 10% gravel.		CL	
65	65.0-66.5	9-12-13	0.25	0.2 ppm	CL - Gravelly silty CLAY, similar to sample 60.0 to 65.0 ft.; 60% clay; 20% silt; 10% gravel; 10% sand, med. to coarse grained.		CL	
70								

NOTES: HNu background = 0.1 ppm

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-217-1</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>3</u> of <u>3</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>55.0</u> <u>0710/5-20-91</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u>56.0</u> <u>1600/5-13-91</u>		Start Date <u>5/13/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/13/91</u>
Total Boring Depth <u>95.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	70.0-71.5	?	1.5	0.2 ppm	SC - Clayey SAND: red.-br.; 80% sand, med. to coarse grained, subang. to subrnd., mod. well to well sorted; 10% clay; 5% silt; 5% gravel.		SC	
75	75.0-76.5	12-12-24	1.5	0.1 ppm	SW - SAND: red.-br.; 90% sand, med. to coarse grained, same as 70.0 to 75.0 ft.; 5% silt; 5% gravel.		SW	
80	80.0-81.5		0		Running sand problems, no sample collected, auger to 85 ft.			
85	85.0-86.5		0		Running sand problems, no sample collected, auger to 90 feet.			
90	90.0-91.5		0		Still having problems with running sands. Auger to 95.0 feet.			
95	95.0-96.5		0		Running sand - no sample Terminate boring.			
100								
105								

NOTES:

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-22</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>1</u> of <u>3</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>40.5'</u> <u>1338/5-16-91</u>		Casing Elev. _____	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>	After Drilling _____		Start Date <u>5/15/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level _____		Finish Date <u>5/16/91</u>	
Total Boring Depth <u>97.0 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
5								
10								
15								
20	20.0-21.5	50/4"	0.3	0.6 ppm	SW-GW - Silty Gravelly SANDS: br.; 20% silt, non-plastic; 50% sand, mostly coarse to fine grained; 30% gravels, with ang. to subang., coarse to dominantly fine gravels, poorly sorted; dry.	< 1257	SW/ GW	
25	25.0-26.5	10-12-16	1.5	0.8 ppm	SW - Silty Gravelly SANDS: dull red.-br.; 20% silt, non-plastic; 65% sand, coarse to fine grained; 25% gravels, coarse to dominantly fine, subang. to ang. gravels, poorly sorted; dry.	< 1307	SW	
30	30.0-31.5	9-12-13	0.8	0.2 ppm	SW - Silty Gravelly SANDS: dk. br.; 10% silt, non-plastic; 70% sand, ang. to subang., with coarse to fine, dominantly med. grained sands; 20% gravels; ang. to subang.; dry to moist.	< 1317	SW	
35								

NOTES:

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-22</u>	
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>3</u>	
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>	
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>40.5</u> <u>1338/5-16-91</u>		Casing Elev. <u> </u>	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling <u> </u>		Start Date <u>5/15/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/16/91</u>	
Total Boring Depth <u>97.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	25-18-21	1.0	0.0 ppm	GM - Sandy Silty GRAVEL: br.; 30% silt, non-plastic to v. low plasticity; 15% sand, coarse to fine grained, mostly med. grained.; 55% gravel, med. to fine, subrnd. to subang., poorly sorted; moist.	< 1322	GM	
40	40.0-41.5	9-6-7	1.5	0.0 ppm	SM - SILT and SAND: br.; 50% silt, non-plastic; 50% sand, med., to fine grained, well sorted; wet. SC/SM - Sandy Clayey SILT: br.; 80% silt, non-plastic; 10% clay; 10% sand, med. to fine grained, firm, layered, mod. sorted; wet.	< 1338 40.5	SM SC/ SM	
45	45.0-46.5	26-18-15	1.3	0.6 ppm	ML - Sandy SILT: br.; 60% silt, non-plastic to very low plasticity, trace amount of bedding plains visible; 40% sand, med. to dominantly fine grained, with increasing % of sand with depth, subrnd. sand grains; wet.	5/16/91 < 0530	ML	
50	50.0-51.5	4-6-7	1.4	0.0 ppm	ML - Clayey Sandy SILT: br.; 5% clay; 80% silt, non-plastic to very low plasticity; 15% sand, coarse to dominantly fine grained sands, mod. sorted; moist.	< 0550	ML	
55	55.0-56.5	4-6-5	1.2	0.0 ppm	ML - Sandy SILT: br.; 85% silt, non-plastic; 15% sand, coarse to mostly fine grained sands; mod. to well sorted; moist.	< 0600	ML	
60	60.0-61.5	6-6-4	0.9	0.0 ppm	ML/SM - Sandy SILT: br.; 90% silt, non-plastic; 10% sand, med. to mostly fine grained, moist. Grading to: SAND and SILT; br.; 50% silt, non-plastic; 50% sand, med. to mostly fine grained; moist.	< 0600	ML ↓ ML/ SM	
65	65.0-66.5	5-7-4	1.1	0.2 ppm	SM/ML - SILT and SAND: br.; 50% silt, non-plastic; 50% sand, med. to mostly fine sands, mod. sorted. Grading to: 70% sand, subang. to subrnd. grains; 25% gravels, subang. to subrnd.; 5% silt, poorly sorted; moist to wet.	< 0618	SM/ ML ↓ SW	
70								

NOTES: * Silt / sand unit @ a depth of 40.5 ft. has created perched water conditions.

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PA-22</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>3</u> of <u>3</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>40.5'</u> <u>1336/5-16-91</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling <u> </u>		Start Date <u>5/16/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/16/91</u>
Total Boring Depth <u>97.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	70.0-71.5	6-4-6	0.3	0.0 ppm	SW - Gravelly SAND: br.; 70% sand, mostly coarse to fine grained, with ang. to subrnd. sands; 30% gravels, med. to fine gravels, subrnd. to rnd.; wet.	< 0632	SW	
75	75.0-76.5	7-6-4	0.5	0.0 ppm	SW - Gravelly SANDS: br.; 80% sands, coarse to fine grained, mostly med. sands; 20% gravel med. to fine gravels, subang. to subrnd., poorly sorted; wet.	< 0637	SW	
80	80.0-81.5	8-6-7	0.3	0.0 ppm	SW - Gravelly SANDS: br.; 85% sand, coarse to fine grained, mostly med.; 15% gravels, med. to mostly fine, subang. to subrnd. gravels, poorly sorted; wet.	< 0649	SW	
85	85.0-86.5	9-7-7	0.7	0.0 ppm	SW/SM - Silty Gravelly SANDS: br.; 25% silt, non-plastic; 50% sand, coarse to fine, mostly med. grained sands, with subang. to subrnd. grains; 25% gravels, med. to fine, angular to subrnd. gravels, poorly sorted; wet.	< 0703	SW/ SM	
90	90.0-91.5	8-8-6	0.3	0.0 ppm	SM/SP - Gravelly Silty SAND: br.; 45% sand, coarse to mostly fine grained. Grading to 40% silt, non-plastic to very low plasticity; 15% gravels, coarse to mostly fine gravels, ang. to subrnd., poorly sorted; wet.	< 0715	SM/ SP	
95	95.0-96.5	10-9-8	0.2	0.0 ppm	SP - Silty Gravelly SANDS: br.; 10% silt, non plastic; 70% sand, coarse to fine grained, mostly med. sands; 15% gravels, med. to mostly fine gravels, ang. to subrnd.; wet	< 0737	SP	
					Bottom of boring 97.0 ft.			
100								
105								

NOTES: * Boring terminated at a depth of 97.0 ft. because of running sands.

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-23</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>1</u> of <u>1</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u> </u> <u>Not available</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling <u> </u> <u> </u> <u> </u>		Start Date <u>5/15/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u> <u> </u> <u> </u>		Finish Date <u>5/15/91</u>
Total Boring Depth <u>28.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
5								
10								
15								
20	20.0-21.5	50/3"	0.2	0.0 ppm	GW - Gravelly silty SAND: red.-br.; 5% silt, non-plastic to very low plasticity; 70% sand, fine to coarse grained, subrnd. to subang.; 25% gravels, ang., poorly sorted; dry.	< 1059	GW	
25	25.0-26.5	50/1"	NR	NA	NO RECOVERY.	< 1111		
					AUGER REFUSAL @ 28.0 FT			
					Bottom of boring @ 28.0'			
30								
35								

NOTES: * Original soil/pilot boring location was abandoned @ a depth of 14.5 ft. (location was offset) and revised location was abandoned @ 28.0 ft. Boring operations terminated because of heavy concentrations of cobbles / gravels (streambed deposits) in PB-23 location.

ICF KAISER ENGINEERS

BORING LOG

Project name Goodyear Tire & Rubber Co. Project No. 03761-005-00
 Location Goodyear, Arizona - PGA Site
 Drilling Firm Heber Mining Co. Water Levels: Depth Elevation Time/Date
 Drilling Method Hollow Stem Auger During Drilling 45.0 0737/5-23-91
 Hollow-Stem Auger O.D. 8" I.D. 3" After Drilling _____
 Rotary Bit Dia. N/A Casing Dia. N/A Well Level _____
 Total Boring Depth 67.0 ft. Depth Measured Relative To Grade

Boring No. PB-24
 Sheet 1 of 2
 G.S. Elev. _____
 Casing Elev. _____
 Start Date 5/23/91
 Finish Date 5/23/91
 Logged By J. Moore

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LTH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
5								
10	10.0-11.5	14-21-50	0.5	0.0 ppm	SM - Silty SAND; br.; 10% silt, non-plastic to v. low plasticity; 90% sand, coarse to fine grained, mostly fine sands, "caliche", poorly sorted, poorly cemented; dry.	< 0634	SM	
15								
20	20.0-21.5	29-40-50/4"	0.7	0.0 ppm	SW - Silty gravelly SAND; br.; 5% silt, non-plastic; 70% sand, coarse to fine grained, mostly med. sands; 25% gravels, med. to mostly fine, subang., to subrnd., poorly sorted, poorly cemented; dry.	< 0645	SW	
25	25.0-26.5	16-20-32	0.9	0.0 ppm	SW - Same as above; dry.	< 0705	SW	
30	30.0-31.5	50/6"	0.4	0.0 ppm	GW - Sandy GRAVELS; br.; 40% sand, coarse to fine, mostly coarse sands; 60% gravels, coarse to fine, mostly fine, ang. to subrnd. gravels; hard, dense "streambed type" deposits; dry.	< 0718	GW	
35								

NOTES: * Gravel observed @ a depth of 12.0 ft. (or very hard caliche)

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-24</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>2</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>46.0</u> <u>0737/5-23-91</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling <u> </u>		Start Date <u>5/23/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/23/91</u>
Total Boring Depth <u>67.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	50/6"	0.4	1.0 ppm	SW - Silty gravelly SAND: br.; 5% silt; 60% sand, coarse to fine sands, mostly med. grained; 35% gravels, coarse to mostly fine, ang. to subang. gravels, poorly sorted; dry to moist.	< 0718	SW	
40	40.0-41.5	50/6"	0.3	0.6 ppm	GW - Silty sandy GRAVELS: br.; 10% silt, non-plastic; 40% sand, coarse to fine, mostly med.; 50% gravels, coarse to fine,, mostly fine, subang. to subrnd., hard, dense, poorly cemented; moist.	< 0730	GW	
45	45.0-46.5	50/5"	NR	NA	No recovery.	< 0737	WET @ 45'	
50	50.0-51.5	50/5"	0.3	0.0 ppm	GW - Silty sandy GRAVEL: br.; 5% silt, non-plastic; 35% sand, coarse to fine, mostly fine sands; 60% gravels, coarse to mostly fine, subrnd. to subang., poorly sorted, "streambed deposits"; wet.	< 0748	GW	
55	55.0-56.5	11-17- 50/5"	0.6	0.0 ppm	GW - Sandy GRAVEL: br.; 35% sand, coarse to fine, mostly med. sands; 65% gravels, coarse to fine, mostly fine, subrnd. to rnd., "streambed deposits"; wet.	< 0800	GW	
60	60.0-61.5	50/6"	NR	NA	No recovery.	< 0815		
65	65.0-66.5	50/3"	NR	NA	No recovery.	< 0831		
					Bottom of boring @ 67.0 ft.			
70								

NOTES: Augers are unable to continue downward borehole advancement because of auger teeth worn out.
Boring terminated @ 67.0'.

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-27/1-15</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>1</u> of <u>3</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>55.0'</u> <u> </u> <u>0615/5-15-91</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u>64.0'</u> <u> </u> <u>0800/5-15-91</u>		Start Date <u>5/14/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/15/91</u>
Total Boring Depth <u>97.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	P.D. or OVA(1)				
					No samples collected from 0.0 to 20.0 ft. This zone is characterized by gravels, silts and sands.			
5								
10								
15								
20	20.0-21.5	30-50/.5'	1.5	0.2 ppm	ML - SILT, gravelly silt; lt. red.-br.; 90% silt; gravel, clay and sand make up remaining 10%.		ML	
25	25.0-26.5	12-15-23	1.5	0.2 ppm	ML - Clayey SILT; lt. br.; 80% silt; 20% clay, brittle, but has cohesion.		ML	
30	30.0-31.5	50/0.4'	1.0	0.2 ppm	ML - Upper 4 inches same as above SW - Lower 6 inches silty gravelly SAND: red.- br.; 70% sand, poorly sorted, subang. to subrnd.; 25% gravel; 5% clay.		ML SW	
35								

NOTES: HNu background = 0.1 ppm

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-27/1-1c</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>3</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>55.0'</u> <u>0615/5-15-91</u>		Casing Elev. _____
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u>64.0'</u> <u>0800/5-15-91</u>		Start Date <u>5/14/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level _____		Finish Date <u>5/15/91</u>
Total Boring Depth <u>97.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barnes</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	54/0.5'			ML - Upper 5 inches, same as above. GP - Lower 7 inches sandy GRAVEL: red.-br.; 60% gravel, ang. to subang.; 40% sand, ang. to subang., fine to coarse grained, poorly sorted.		ML GP	
40	40.0-41.5	27-55/0.4'	1.0	0.2 ppm	SW - Silty gravelly SAND: red.-br.; 70% sand, poorly sorted, ang. to subang. to subrnd.; 25% gravel, ang. to subrnd.; 5% silt and clay.		SW	
45	45.0-46.5	50/0.4'	0.4'	0.6 ppm	GM - Silty, sandy GRAVEL: red.-br.; 40% gravel, up to 1 inch in diameter; 30% silt; 20% sand, fine to coarse grained, subang. to subrnd.; 10% clay.		GM	
50	50.0-51.5	50/1.5"	1.5"	0.2 ppm	GC - Sandy clayey GRAVELS: br.; 50% gravel, ang. to subang., mineral constituents/rock types of gravels include olivines, quartz feldspathoids, and ferromagnesium; 30% clay; 20% sand, fine to coarse grained, subang. to subrnd.; moist, slightly plastic.		GC	
55	55.0-56.5	21-17-18	3"	0.2 ppm	GC - Clayey sandy GRAVEL: br.; 60% gravel; 30% sand; 10% clay; sample similar to (50.0-55.0).		GC	
60	60.0-61.5	24-13-20	1.4	0.2 ppm	SP - Upper 4" red.-br.; 100% SAND, very fine grained with a trace of silt GC - Upper middle 4" clayey gravelly SAND: red.-br.; 40% sand, fine to coarse grained, subang. to subrnd., mod. well sorted; 30% gravel, up to 1/4 inch in diameter, 30% clay gravel, up to 1/4 inch in diameter, 30% clay SW - Lower middle 5" SAND: red.-br.; 100% sand, trace of silt., fine to coarse grained, poorly sorted, subang. to subrnd. CL - Bottom 3" silty CLAY: red.-br.; 70% clay; 30% silt.		SP GC SW	
65	65.0-66.5	4-4-8	1.0	0.2 ppm	SP - Upper 9" silty gravelly SAND: red.-br.; 70% sand, same as previous descriptions on sorting and rounding, fine to coarse grained; 30% gravel, up to 1/4" in size. CL - Lower 3" silty CLAY: red.-br.; 70% clay; 30% silt.		SP CL	
70								

NOTES: * Wet @ approximately 55.0 ft.

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-28/1-20</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>3</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>50.0'</u> <u>0745/5-15-91</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u>41.8'</u> <u>5-15-91</u>		Start Date <u>5/14/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/15/91</u>
Total Boring Depth <u>106.5 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	70.0-71.5	6-4-8	1.5	0.2 ppm	SP - Same as above - 95% sand; 5% silt.	< 0840	SP	
75	75.0-76.5	4-8-9	1.5	0.2 ppm	SP - Same as above - except 95% sand; 5% silt and gravels.	< 0850	SP	
80	80.0-81.5	4-4-6	1.5	0.2 ppm	SP - Same as 75-80'. Base of sample 2" of red.-br. silt. V. brittle, firm; moist but not wet.	< 0900	SP	
85	85.0-86.5	4-6-5	1.0	0.2 ppm	ML - SILT: red.-br.; 100% silt, firm but brittle, moist but not wet, could act as an aquitard.		ML	
90	90.0-91.5	3-3-6	0.7	0.2 ppm	CL - Silty sandy CLAY: red.-br.; 90% clay; 5% silt; 5% sand.		CL	
95	95.0-96.5	4-4-6	1.5	0.2 ppm	SP - SAND: red.-br.; 100% sand, med. to coarse grained, subang. to submd., moderately well sorted.		SP	
100	100.0- 101.5		1.0	0.2 ppm	SP - Same as above (90-95'); trace silt.		SP	
105								

NOTES: * Hnu background 0.2 ppm @ 0800
Hnu annulus reading 0.2 ppm @ 0820

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>	Project No. <u>03761-005-00</u>	Boring No. <u>PB-28/1-20</u>
Location <u>Goodyear, Arizona - PGA Site</u>		Sheet <u>1</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>	G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>50.0'</u> <u>0745/5-15-91</u>	Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>	After Drilling <u>41.8'</u> <u>5-15-91</u>	Start Date <u>5/14/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u> </u>	Finish Date <u>5/15/91</u>
Total Boring Depth <u>106.5 ft.</u>	Depth Measured Relative To <u>Grade</u>	Logged By <u>Borner</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
5					No samples collected first 20 feet - This zone is characterized by silts, gravels and sands.			
10								
15								
20	20.0-21.5	50/0.4'	0.4	0.2 ppm	SM/GM - Gravelly silty SAND: lt. br.; 40% very fine to coarse sand, subang. to subrnd., poorly sorted; 40% silt; 30% gravel, up to 1.25".	< 0645	SM/ GM	
25	25.0-26.5	31-35-38	1.0	0.2 ppm	GW - Silty sandy GRAVEL: lt. br. to red.-brown; 50% gravel, ang. to subrnd., variable color and mineral composition; 40% sand, fine to coarse grained, poorly sorted, subang. to subrnd.; 10% silt.	< 0700	GW	
30	30.0-31.5	50/0.4'	0.3	0.2 ppm	P - Gravelly SAND: as above except greater percentage of sand (60%), trace silt.	< 0705	SP	
35								

NOTES: Hnu background 0.2 ppm @ 0630

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PS-28/1-20</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. _____
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>50.0'</u> <u>0745/5-15-91</u>		Casing Elev. _____
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>		After Drilling <u>41.8'</u> <u>5-15-91</u>		Start Date <u>5/14/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level _____		Finish Date <u>5/15/91</u>
Total Boring Depth <u>106.5 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	35-29- 42/0.25'	0.7	0.2 ppm	GW - Silty sandy GRAVEL: br. to red.-br.; 50% gravel variable mineral composition, ang. to subrnd.; 40% sand, fine to coarse grained, poorly sorted, subang. to subrnd.; 10% silt.	< 0710	GW	
40	40.0-41.5	38-50/0.4'	1.0	0.2 ppm	GC - Clayey sandy GRAVEL: br.; 40% gravel, ang. to subrnd.; 30% sand, fine to coarse grained, poorly sorted, subang. to subrnd.; 30% clay.	< 0720	GC	
45	45.0-46.5	22-50/0.3'	0.5	0.2 ppm	CL - Silty CLAY: red.-brown; 50% silt, 50% clay. At bottom of sample lt. br. to white caliche layer about 2 inches thick.	< 0740	CL	
50	50.0-51.5	7-12-32	1.5	0.2 ppm	SP - SAND: red.-brown; 100% sand, mod. well sorted, subang. to subrnd. Mineral composition consists of quartz, feldspar, and ferromagnesium minerals.	< 0745	SP	
55	55.0-56.5	5-7-8	1.5	0.2 ppm	SP - Silty Clayey Sand: reddish brown color; 90% sand as above; 5% silt; 5% clay.	< 0810	SP	
60	60.0-61.5	5-5-9	1.0	0.2 ppm	SP - SAND: 100% sand, same as 50-55', trace of silt.	< 0820	SP	
65	65.0-66.5	5-8-14	1.5	0.2 ppm	SP - SAND: 100% sand, same as 50-55' except coarse grained, med. to coarse sand.	< 0825	SP	
70								

NOTES:

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-28/</u> <u>1-20</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>4</u> of <u>4</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>50.0'</u> <u>0745/5-15-91</u>		Casing Elev. <u> </u>	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3 1/4"</u>	After Drilling <u>41.8'</u> <u>5-15-91</u>		Start Date <u>5/14/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u> </u>		Finish Date <u>5/15/91</u>	
Total Boring Depth <u>106.5 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>Barner</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	105.0- 106.5	8-12-10	1.0	0.2 ppm	SP - As previous sample, slightly more silt (5%).		SP	
					Bottom of boring @ 106.5 ft.			
110								
115								
120								
125								
130								
135								
140								

NOTES:

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-29</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>1</u> of <u>2</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u></u>	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>45.0'</u> <u>1305/5-22-91</u>		Casing Elev. <u></u>	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>	After Drilling <u></u> <u></u> <u></u>		Start Date <u>5/22/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u></u> <u></u> <u></u>		Finish Date <u>5/22/91</u>	
Total Boring Depth <u>67.0 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
5								
10	10.0-11.5	12-18-25	0.7	0.0 ppm	ML - Gravelly sandy SILT: red-br.; 70% silt, non-plastic, brittle, bedding plains visible; 20% sand, med. to mostly fine sands; 10% gravels, med. to fine, ang. to subrnd, poorly sorted; dry.	< 1118	ML	
15								
20	20.0-21.5	13-14-38	1.3	0.0 ppm	SW - Silty gravelly SANDS: red.-br.; 10% silt, non-plastic; 50% sand, coarse to fine grained, mostly med. sands; 40% gravels, coarse to fine, subang. to subrnd, poorly cemented, poorly sorted; dry.	< 1130	SW	
25	25.0-26.5	50/5"	0.3	0.0 ppm	SW - Gravelly SAND: br.; 80% sand, coarse to fine sands, mostly med.grained; 20% gravels, coarse to fine gravels, v. angular to subang., poorly cemented "caliche", poorly sorted; dry.	< 1145	SW	
30	30.0-31.5	50/4"	0.2	0.0 ppm	GW - Silty sandy GRAVEL: br.; 5% silt; 15% sand, coarse to fine sands; 80% gravels, coarse to fine, mostly fine, subang. to subrnd, poorly sorted, streambed deposits; dry to moist	< 1153	GW	
35								

NOTES: * Gravels first observed @ 13 ft. below grade.

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BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-29</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>2</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>45.0'</u> <u>1305/5-22-91</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling <u> </u>		Start Date <u>5/22/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/22/91</u>
Total Boring Depth <u>62.0 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	35.0-36.5	18-50/5"	0.7	0.0 ppm	SW - Gravelly SAND: gray-br.; 95% sand, coarse to fine, mostly med. grained; 5% gravel, mostly fine, subang. to subrnd.; moist.	< 1207	SW	
40	40.0-41.5	27-50/2"	NR	NA	NO RECOVERY.	< 1305		
45	45.0-46.5	7-13-12	0.9	0.6 ppm	ML - Sandy gravelly SILT: red.-br.; 70% silt, non-plastic to very low plasticity; 5% sand, coarse to fine sand; 25% gravels; med. to fine gravels, subrnd.; wet.	< 1316	ML	
50	50.0-51.5	18-20-26	1.2	0.0 ppm	ML - Sandy clayey SILT: red.-br.; 90% silt, non-plastic to very low plasticity; 5% clay; 5% sand, fine-grained sand, micaceous, with black organic layers; moist to wet.	< 1328	ML	
55	55.0-56.5	14-19-22	NR	NA	NO RECOVERY.	< 1340	NA	
60	60.0-61.5	50/4"	NR	NA	NO RECOVERY.	< 1353	NA	
65					Bottom of boring 62.0 ft.			
70					No recovery (NR) NA - Not Available			

NOTES: * Because of poor recovery on last ten foot of boring and problems with running sands boring was terminated @ 62.0 ft.

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-30</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>1</u> of <u>1</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>not observed</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling <u> </u>		Start Date <u>5/22/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/22/91</u>
Total Boring Depth <u>29 / 26 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
5								
10	10.0-11.5	34-50/4"	0.4	0.0 ppm	ML - Sandy, gravelly SILT: lt. br.; 80% silt, brittle, "caliche type", non-plastic; 5% sand, mostly fine grained; 15% gravels, med. to mostly fine, subrnd. to subang., poorly sorted, hard; dry.	< 0857	ML	
15								
20	20.0-21.5	50/4"	0.2	0.0 ppm	GM - Sandy silty GRAVEL: gray br.; 15% silt, non-plastic; 10% sand, med. to mostly fine grained; 75% gravels, med. to mostly fine, ang. to subang., poorly sorted; dry.	< 0914	GM	
25	25.0-26.5	26-50/4"	0.4	0.0 ppm	GM - Sandy silty GRAVEL: red-br.; 30% silt, non-plastic to v. low plasticity; 10% sand, coarse to fine sands, mostly med. sands; 60% gravels, coarse to fine, mostly fine gravels, subrnd. to subang., poorly sorted, streambed deposits; moist to dry.	< 0924	GM	
30					Bottom of boring @ 29.0 ft.			
35								

NOTES:

Driller observed gravels at a depth of 6.0 ft. Auger refusal observed at 26.0 ft.
Borehole location was offset 25.0 ft. and redrilled. Auger refusal observed at 29.0 ft.

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-31</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>1</u> of <u>2</u>
Drilling Firm <u>Heber Mining Co.</u>		Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>
Drilling Method <u>Hollow Stem Auger</u>		During Drilling <u>not observed</u>		Casing Elev. <u> </u>
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>		After Drilling <u> </u>		Start Date <u>5/22/91</u>
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>		Well Level <u> </u>		Finish Date <u>5/22/91</u>
Total Boring Depth <u>30 / 34 ft.</u>		Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION	
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)					
5									
10	10.0-11.5	28-21-30	0.6	0.8 ppm	ML/gM - Sandy gravelly SILT: dull br.; 50% silt, non-plastic; 10% sand, coarse to fine, mostly med. sands; 40% gravels, coarse to fine, mostly fine, subrnd. to subang., gravels, poorly sorted; dry.	< 0600	ML/ GM		
15									
20	20.0-21.5	15-18-22	0.7	0.8 ppm	SW - Silty gravelly SAND: red br.; 5% silt, non-plastic; 65% sand, coarse to fine, mostly med. sands, poorly cemented; 30% gravels, coarse to fine, very ang. to subang., poorly sorted, dense; dry.	< 0615	SW		
25	25.0-26.5	50/5"	0.7	0.6 ppm	GM - Sandy silty GRAVEL: gray-white to red.-br.; 30% silt, non-plastic; 10% sand, coarse to fine, mostly med. sands; 60% gravels, coarse to fine, mostly fine, subang. to subrnd.; dry.	<0630	GM		
30	30.0-31.5	37-50/4"	0.5	0.6 ppm	GM - Sandy silty GRAVEL: red.-br.; 20% silt; 15% sand, coarse to fine, mostly med. sands; 65% gravels, hard, dense, "streambed deposits", coarse to fine, subang. to subrnd. gravels, poorly sorted; moist to dry.	<0643	GM		
35									

NOTES:

- * Gravel zone first observed at 8.0 ft.
- ** First borehole abandoned at a depth of 30.0 ft., "auger refusal".

ICF KAISER ENGINEERS

BORING LOG

Project name <u>Goodyear Tire & Rubber Co.</u>		Project No. <u>03761-005-00</u>		Boring No. <u>PB-31</u>
Location <u>Goodyear, Arizona - PGA Site</u>				Sheet <u>2</u> of <u>2</u>
Drilling Firm <u>Heber Mining Co.</u>	Water Levels: <u>Depth</u> <u>Elevation</u> <u>Time/Date</u>		G.S. Elev. <u> </u>	
Drilling Method <u>Hollow Stem Auger</u>	During Drilling <u>not observed</u>		Casing Elev. <u> </u>	
Hollow-Stem Auger O.D. <u>8"</u> I.D. <u>3"</u>	After Drilling <u> </u>		Start Date <u>5/22/91</u>	
Rotary Bit Dia. <u>N/A</u> Casing Dia. <u>N/A</u>	Well Level <u> </u>		Finish Date <u>5/22/91</u>	
Total Boring Depth <u>30 / 34 ft.</u>	Depth Measured Relative To <u>Grade</u>		Logged By <u>J. Moore</u>	

SCALE IN FEET	SAMPLE				MATERIAL DESCRIPTION	TIME	LITH. SECT.	WELL CONSTRUCTION
	DEPTH RANGE	SPT BLOWS per 6 in.	REC.	PID or OVA(1)				
	34.0-35.5	50/3"	0.1	0.4 ppm	SW - Gravel SAND: lt. br.; 80% sand, "caliche", poor to moderate cementation, coarse to fine grained, mostly med. sands; 20% gravels, med. to mostly fine gravels, subang. to ang., dense; hard to dry to moist.	< 0719	SW	
40					Bottom of boring @ 34.0 ft.			
45								
50								
55								
60								
65								
70								

NOTES: * Second boring abandoned at a depth of 34 ft. because of boulders/ cobbles and gravel causing auger refusal.